Vol. 10, No. 1

JANUARY, 1955

AGRICULTURAL CHEMICALS

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Systemics for Livestock Pests

Cotton Insect Control Conference

Grain Fumigation

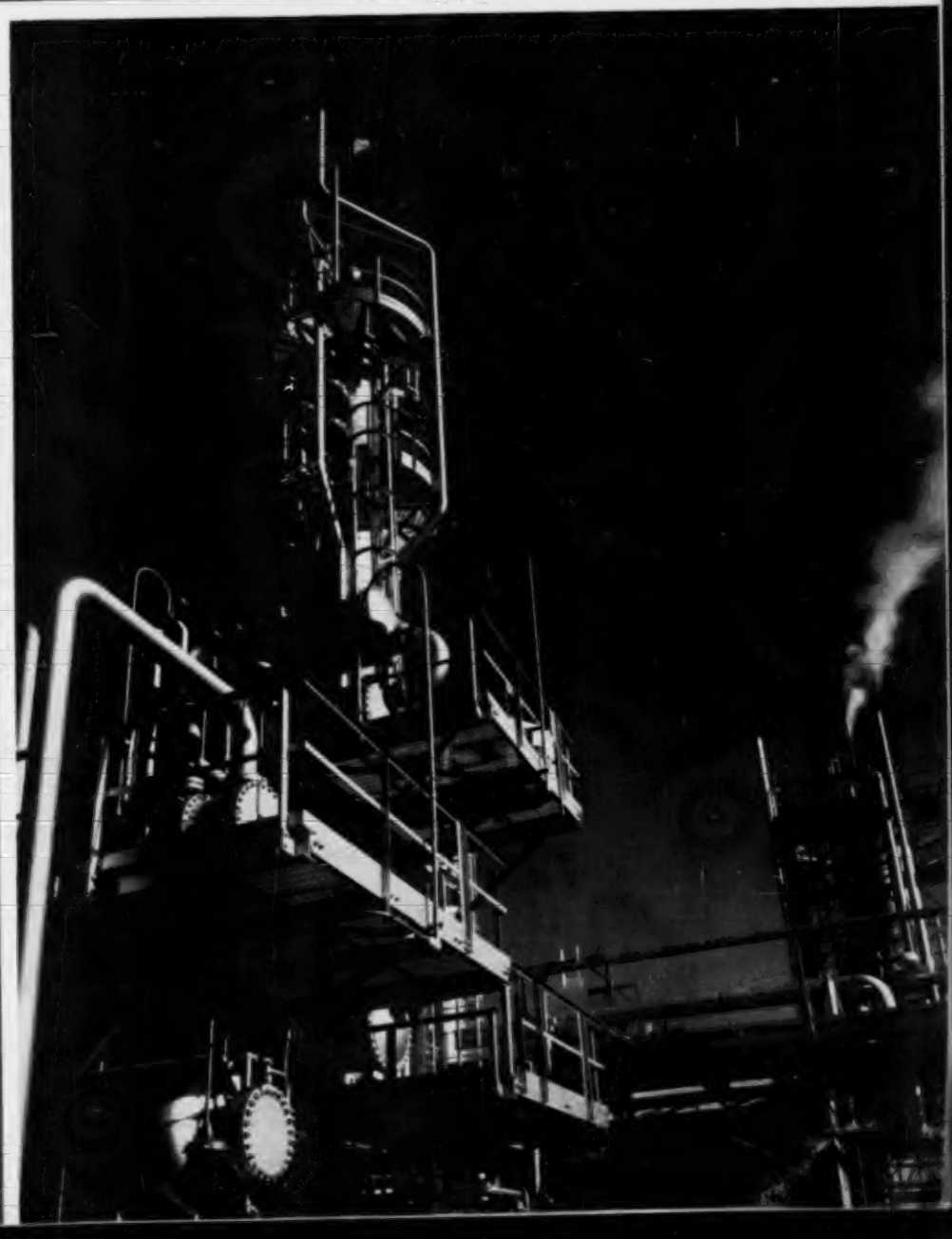
ESA Elects Decker

Anhydrous Ammonia Meeting

N. C. Experiment Station

Recent Systox Studies

Fertilizer Production Analysis



gone!

We're not selling the Brooklyn Bridge. No, not even a pig in a poke. The man with the POWCO BRAND insecticides knows exactly what he's getting — *fast knockdown and quick kill.*

HOUSEHOLD and INDUSTRIAL CONCENTRATES

Solubility, stability and dependability make POWCO BRAND the leader in this field. Formulations include Pyrethrum, DDT, Lindane, Chlordane, Dieldrin, and Malathion.

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All formulations (regular Powell products or custom made) are subjected to Powell's rigid laboratory control. Formulations include Allethrin, Pyrethrum, Sesamin, Piperonyl Butoxide, DDT, and other approved toxicants.

LOOK TO POWELL...For Consistent Trouble-Free Quality

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A Thought for the New Year

A thought for consideration as we enter the new year. —

Confidence is similar to a pebble in a lake — it forms ever widening circles.

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Carlsbad, New Mexico

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Bad news for him . . . good news for you

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. . . the current issue of Attaclay Pesticide Digest, discussing various aspects of pesticide processing. Write for your copy, and future Digests as published.

Could it be this worried army worm is reading his own death warrant in the Attaclay Pesticide Digest? Oh, well . . . his hard luck is your good fortune.

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Attaclay's efficiency extends to the full range of synthetic organic pesticide chemicals. With only *one* across-the-board carrier and diluent to stock, you save time, trouble, and money in ordering, warehousing, scheduling, and handling.

Our suggestion! Depend on Attaclay to keep your plant producing premium products at speediest rate. We're pleased to offer large free samples and technical help.

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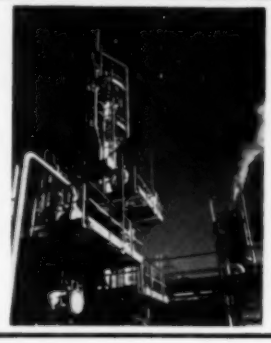
AGRICULTURAL CHEMICALS



This Month's Cover

New ammonia-urea plant of Grace Chemical Co., in Memphis, Tenn., which was opened officially at dedication ceremonies January 6th. (See story page 83)

JANUARY 1955
Vol. 10 No. 1

A Monthly Magazine For the Trade

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YOU GET ALL THESE IMPORTANT ADVANTAGES WITH COOPER EMULSIFIERS!

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For top performance in BHC, BHC/DDT, and Dieldrin systems.

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Leading emulsifier for Malathion formulations.

COOPER CTX-54
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Meeting Calendar

Jan. 3-4 — Missouri State Horticultural Society, Daniel Boone Hotel, Columbia, Mo.

Jan. 3-7 — Annual Agricultural Conference, Purdue Univ., Lafayette, Ind.

Jan. 4-5—Pesticide School, N. Carolina St. College, Raleigh, N. C.

Jan. 5-7—Northeastern Weed Conference, Hotel New Yorker, New York City.

Jan. 6-7 — Nebraska State Weed Conference, Hotel Lincoln, Lincoln, Neb. Chemical and equipment exhibits included.

Jan. 9-12 — Middle States Garden Supply Show, Hotel Sherman, Chicago.

Jan. 14—American Society of Agronomy, Mississippi Section, State College, Miss.

Jan. 17-19 — Cotton States Branch, E. S. A., Tampa Terrace Hotel, Tampa, Fla.

Jan. 17-19 — Southern Weed Conference, Soreno Hotel, St. Petersburg, Fla.

Jan. 17-19—Pacific Northwest Vegetable Insect Conference, Imperial Hotel, Portland, Ore.

Jan. 19-21 — Pacific Northwest Agricultural Chemical Industry Conference, Imperial and Benson Hotels, Portland, Ore.

Jan. 20-21 — Custom Spray Operator's School, Univ. of Illinois, Urbana, Ill.

Jan. 20-21 — Chemical Market Research Assoc., joint meeting with Commercial Chemical Development Assoc., Edgewater Beach Hotel, Chicago.

Jan. 28 — Colorado Agricultural Chemicals Assoc., Cosmopolitan Hotel, Denver, Colo.

Jan. 31-Feb. 3 — Eastern States Garden Supply Show, 71st Infantry Regiment Armory, New York City.

Feb. 7-9 — Association of Southern Agricultural Workers, annual meeting, Louisville, Ky.

Feb. 7-9—Southern Division, American Phytopathological Society, Louisville, Ky.

Feb. 11—New York Section, American Chemical Society, Carbide and Carbon Cafeteria, 30 E. 42nd St., New York City.

Feb. 17-18 — Middle West Soil Improvement Committee, Palmer House, Chicago.

Feb. 23-25 — Midwestern Chapter of the National Shade Tree Conf., Chase Hotel, St. Louis, Mo.

Feb. 23-25 — Use of Aerial Equipment in Agriculture, 4th Annual Conference, Purdue Univ., Lafayette, Ind.

March 7-9 — National Agricultural Chemicals Assoc., Spring Meeting, Chase & Park Plaza Hotel, St. Louis, Mo.

Mar. 22-24 — National Farm Chemurgic Council, Dashler-Hilton Hotel, Columbus, Ohio.

March 8-9 — Western Cotton Production Conference, Hotel Westward Ho, Phoenix, Ariz.

March 24-25 — N. Central States Branch, E. S. A., East Lansing, Mich.

Nov. 29-Dec. 2 — National E. S. A. Meeting, Netherlands Plaza, Cincinnati.

Tried and Tested Carriers and Diluents

Improved Dispersion

BARDEN CLAY
The accepted standard for all other diluents.

Higher Mortality

SUPREX CLAY
Extra-low screen residue—a premium super-grade carrier for toxicants effecting lower production costs. Recommended for wettable powders and concentrates. Excellent absorptive and suspension properties.

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Greater Uniformity

Better Retention

Maximum Economy

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Right now is the time to make sure you have enough of the exact kinds of ARCADIAN® Nitrogen Solutions to fit your mixed goods production programs for the big spring surge. Nitrogen Division has the broadest line of Nitrogen Solutions available for mixed goods manufacturers. They provide economical sources of nitrate, ammonia and urea nitrogen, and they serve as excellent curing media.

You'll get the best results when you pick the ARCADIAN Solutions best suited to your plant conditions. Nitrogen Division technical service representatives have a detailed knowledge of the wide variety of ammoniation procedures and how they can be used to solve particular production and conditioning problems. Their technical help is available at no cost to Nitrogen Division customers.

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Pardon US for Saying THIS

—BUT we are just a little proud of our reputation for delivering Raymond Multiwalls *when promised*. In fact one of our customers just told us that we ought not to hide our light under a bushel.

Of course there are other features of Raymond service equally important. For example, Raymond Multiwalls are scientifically engineered to meet the exacting requirements of almost every industrial product; to assure its safe delivery from bagging machine to buyer.

Wherever you are, call in a Raymond man and let him discuss *your* shipping needs from every angle. Our long experience in adapting container to contents may actually reduce your bagging costs. THE RAYMOND BAG COMPANY, Middletown, Ohio. Phone 2-5461.

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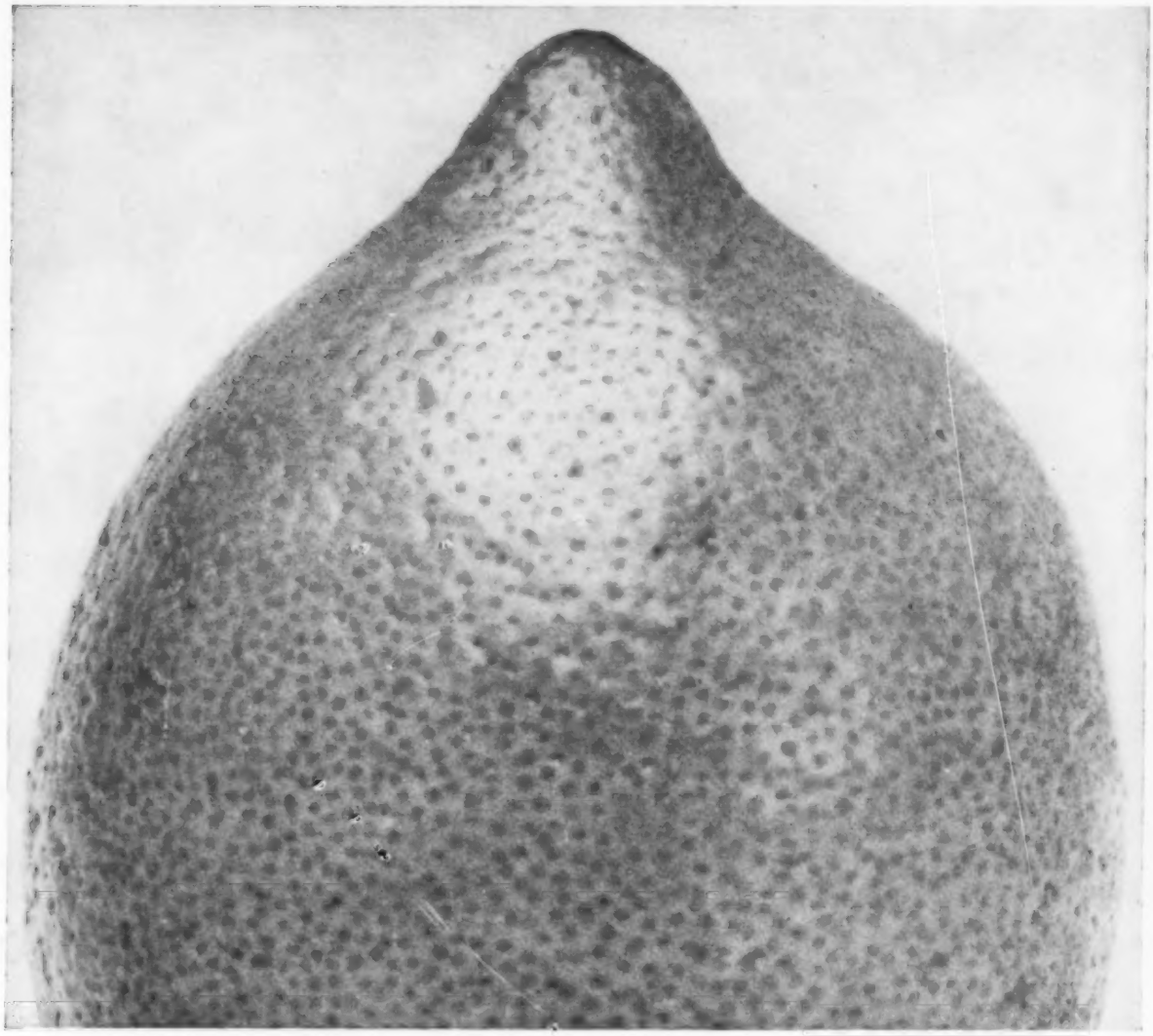

LEMON-AID

Modern commercial fertilizers have been a valuable aid in producing the bigger, more juicy citrus fruits now appearing on American tables.

Potash, an important component of these fertilizers, enriches the soil, improves crop quality, builds resistance to disease, and increases product yield. United States Potash Company high-grade muriate of potash has the highest K_2O content, and is free-flowing and non-caking —important advantages in the production of fertilizers that make today's citrus crops the finest ever grown.

SUNSHINE STATE POTASH · PRODUCT OF NEW MEXICO U.S.A.

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HIGRADE MURIATE OF POTASH 62/63% K_2O
GRANULAR MURIATE OF POTASH 60% K_2O MIN.

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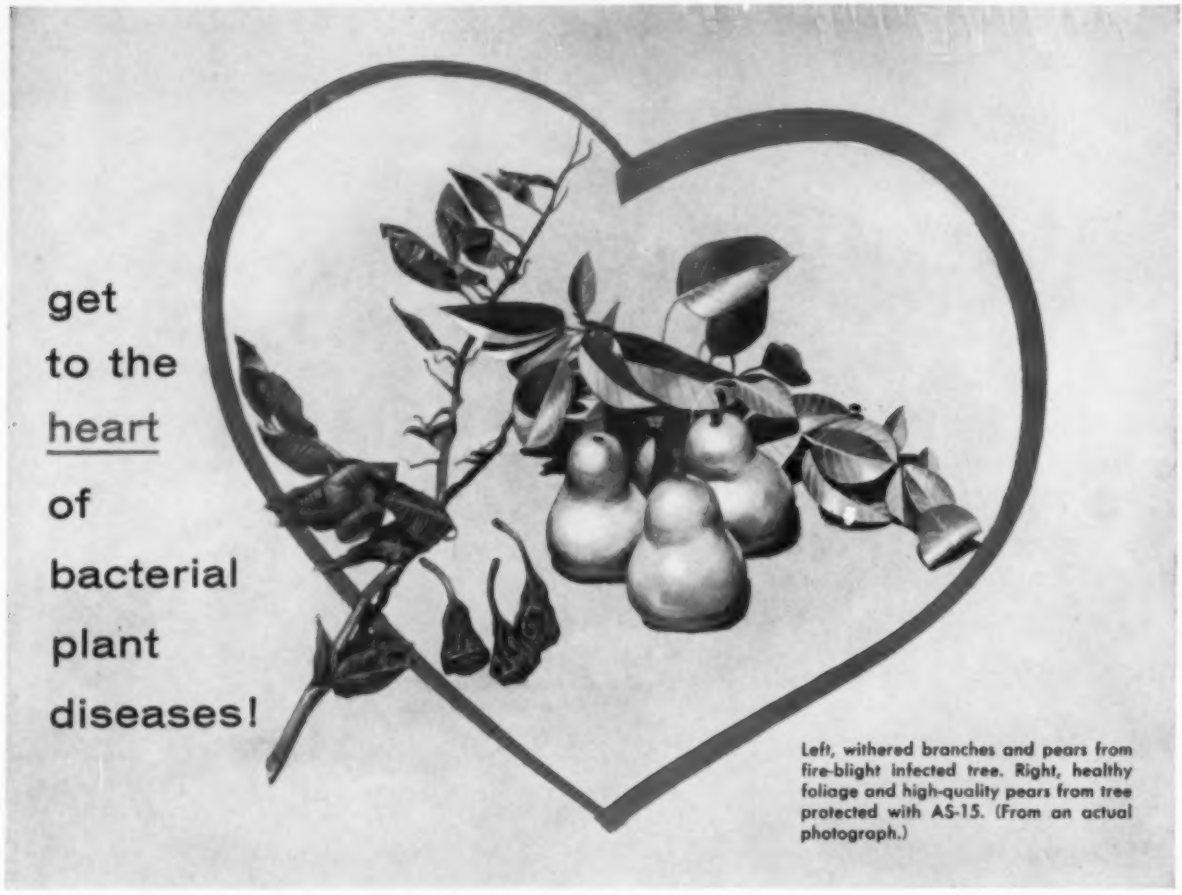
Rhodes-Haverty Building, Atlanta, Georgia



Left, withered branches and pears from fire-blight infected tree. Right, healthy foliage and high-quality pears from tree protected with AS-15. (From an actual photograph.)

Make your systemic spray formulations with

NEW PFIZER AS-15*

(AGRICULTURAL STREPTOMYCIN)

● Now you can formulate a systemic spray material that *gets right into plant tissues* where harmful bacteria are fought best. New soluble Pfizer AS-15, with this effective, penetrating anti-bacterial action, will vastly increase your market. AS-15 is far superior to the typical, insoluble sprays that act only on plant surfaces.

With Pfizer AS-15, your product will offer *real control* of bacteria causing fire blight of apple and pear trees, bacterial spot of tomato and pepper, bacterial blight of walnut trees, soft rot and blackleg of potato. In addition, AS-15 has already indicated its effectiveness in the laboratory against fifteen other plant disease organisms.

For a truly potent anti-bacterial formulation that's a potent *sales-getter*, too—look into the full story of *new* Pfizer AS-15 now. Write for Technical Bulletin 74. The help of our Technical Service Staff is always available on request.

CHAS. PFIZER & CO., INC.
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assures more complete ammoniation, better granulation

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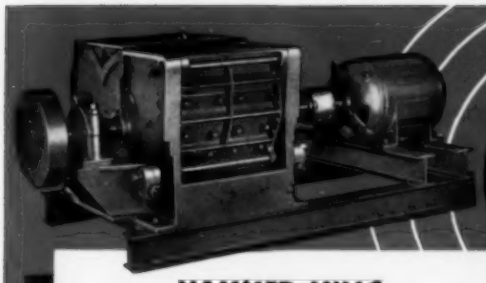

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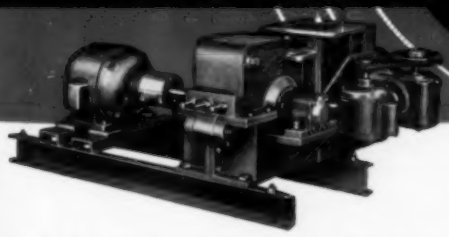
A size for every purpose! Williams Hammer Mills are designed to do the **complete job in a single operation.** No primary or secondary crushers required—extra foundations, conveyors, other expensive equipment are eliminated—thus saving as much as 75% on initial investment and up to 50% on grinding costs!

WILLIAMS has the *Right Answers* to all your GRINDING, CRUSHING, SEPARATING PROBLEMS



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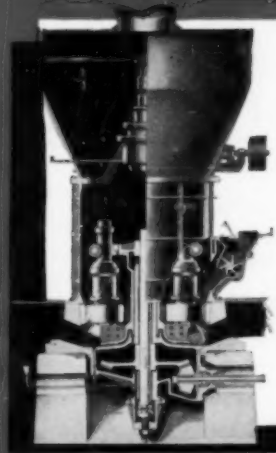
Combines the advantages of a hammer mill with screw-type feed to obtain finenesses from 100 to 325 mesh. For dustless, cleaner, safer dry grinding—accurate, non-clogging reduction of sticky and wet materials. Eliminates separators, fans and cyclones. Furnished with water or steam jackets.



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Pulverizes and blends with exceptional accuracy down to 400 mesh or micron size. Dries as it grinds. Instant size adjustment—automatic self-adjusting feed—many other exclusive features that mean improved quality and output.

Whether your job demands crushing power shovel-loaded stone to 8 mesh or smaller in a single operation—whether it is pulverizing or blending, with or without air separation, of limestone or insecticides to finenesses down to 400 mesh, or even micron sizes—whether it is closed-circuit dustless dry grinding, or the grinding of wet and sticky materials to 325 mesh—there is a Williams "proved-in service" machine that can give you **A BETTER PRODUCT—FASTER PRODUCTION—and LOWER COSTS.**

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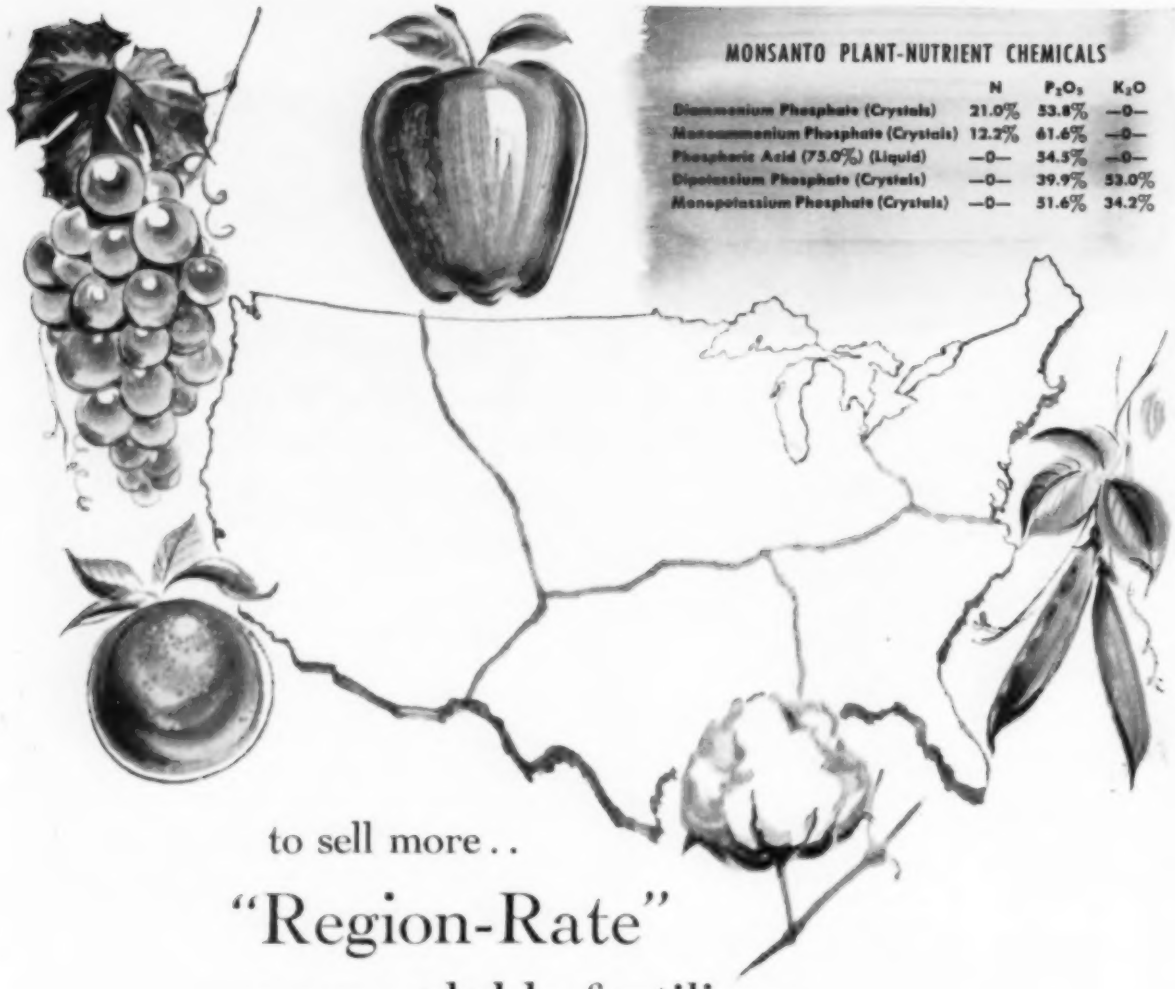
OLDEST AND LARGEST BUILDER OF HAMMER MILLS IN THE WORLD



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	N	P_2O_5	K_2O
Diammonium Phosphate (Crystals)	21.0%	53.8%	—0—
Monoammonium Phosphate (Crystals)	12.2%	61.6%	—0—
Phosphoric Acid (75.0%) (Liquid)	—0—	54.5%	—0—
Dipotassium Phosphate (Crystals)	—0—	39.9%	53.0%
Monopotassium Phosphate (Crystals)	—0—	51.6%	34.2%

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"Region-Rate"

your soluble fertilizer

with MONSANTO PHOSPHATES

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MONSANTO
CHEMICALS—PLASTICS

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Order enough USS Ammonium Sulphate now for big early spring demand

• DURING 1954, sales of 1-1-1 ratio fertilizers (such as 10-10-10) showed a marked increase—more than any other mixture percentage wise. This is evidence of the fact that the big "push" for nitrogen by agronomists, agricultural colleges, farm publications and others is taking effect. And, there's every indication that the trend will be even stronger this year as more farmers find out just how important nitrogen really is to their farm profits.

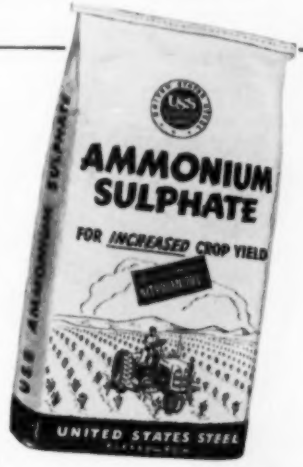
Many states are now engaged in state-wide pasture-improving programs that are bound to boost the sale of high-nitrogen fertilizers, since nitrogen is the most important element in any effective grass pasture program.

Farmers are learning too that *earlier* application in the spring means earlier grass growth and a longer, more productive grazing season. That means that your dealers should be stocked very soon.

Non-leaching USS Ammonium Sulphate is best for early spring

Nitrogen for early spring application—as well as for fall and winter—should be in the non-leaching Ammonia form for best results—and repeat orders. You are safest when you use USS Ammonium Sulphate when selling supplemental nitrogen for direct application, and in your mixed grades as well.

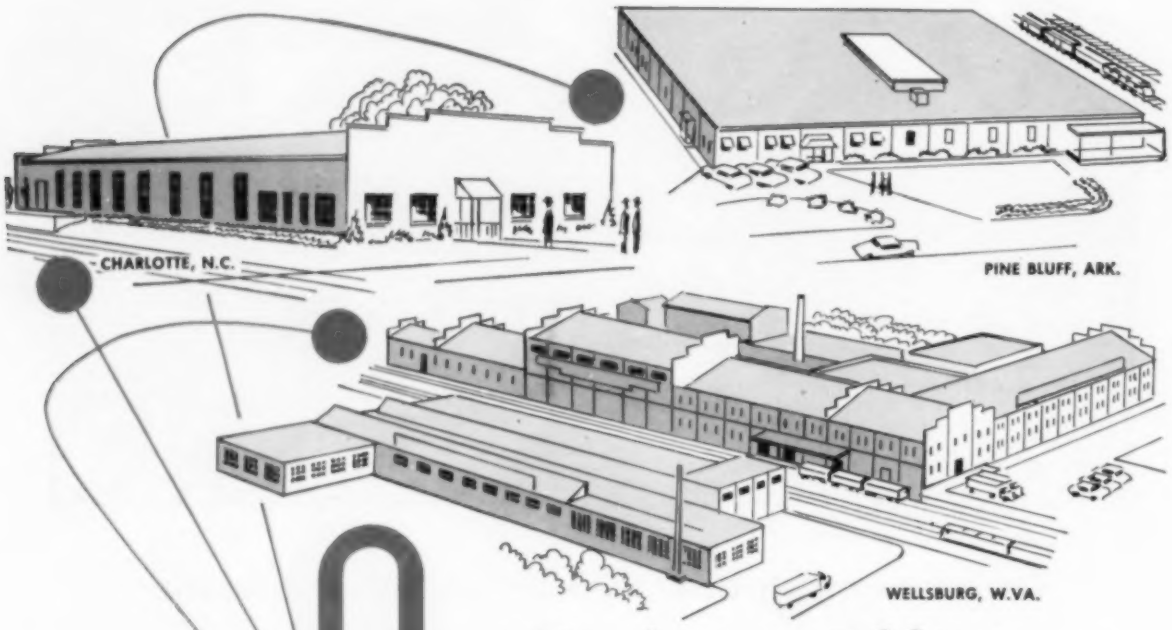
USS Ammonium Sulphate is an easy mixer because it is always free-flowing. And it is less corrosive than similar materials. USS Ammonium Sulphate is available in bulk quantities for mixing and in strong, moistureproof bags for direct sale. Order *now* so that your dealers will be set for *early* spring demand. Contact our nearest Coal Chemical sales office or write direct to United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.



USS AMMONIUM SULPHATE

5-74

UNITED STATES STEEL



3...Modern, Efficient Plants provide fast, dependable service on Hammond Multi-Walls

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You can *depend* on Hammond to provide attractively printed Multi-Wall bags that will display your brands to best advantage and made to your exact specifications . . . delivered when you *need* them.

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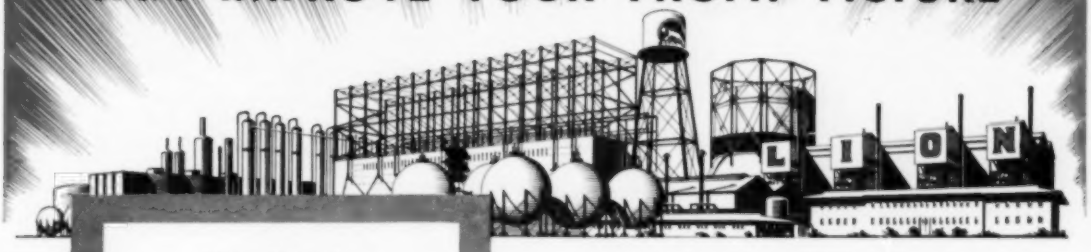
For Multi-Wall bags, "make it a habit to depend on Hammond"

Buying from A LEADER CAN IMPROVE YOUR PROFIT PICTURE



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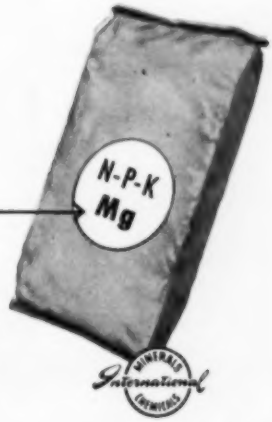

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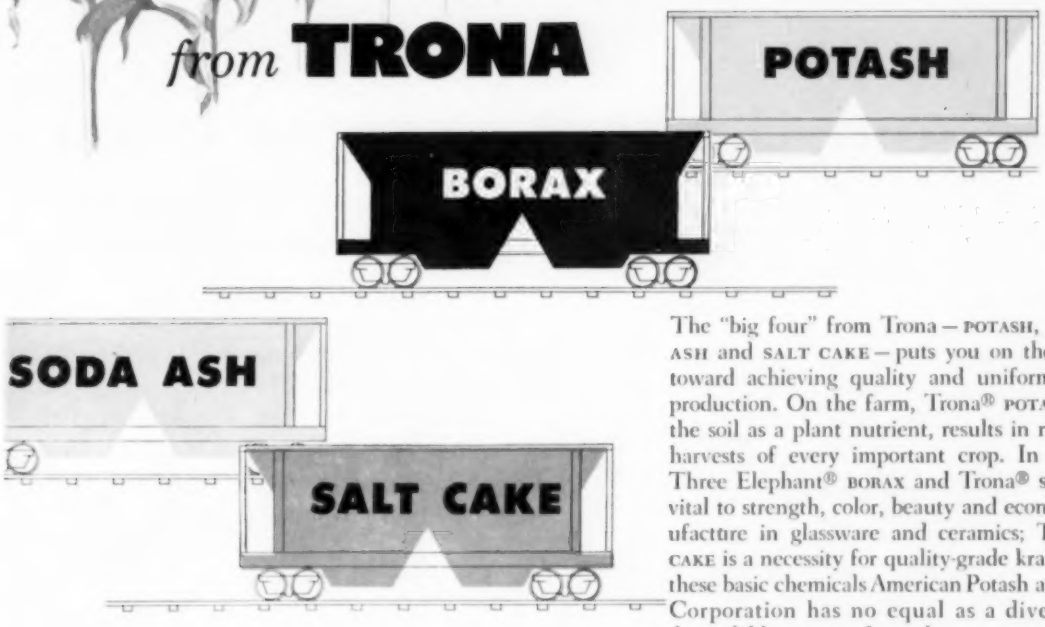

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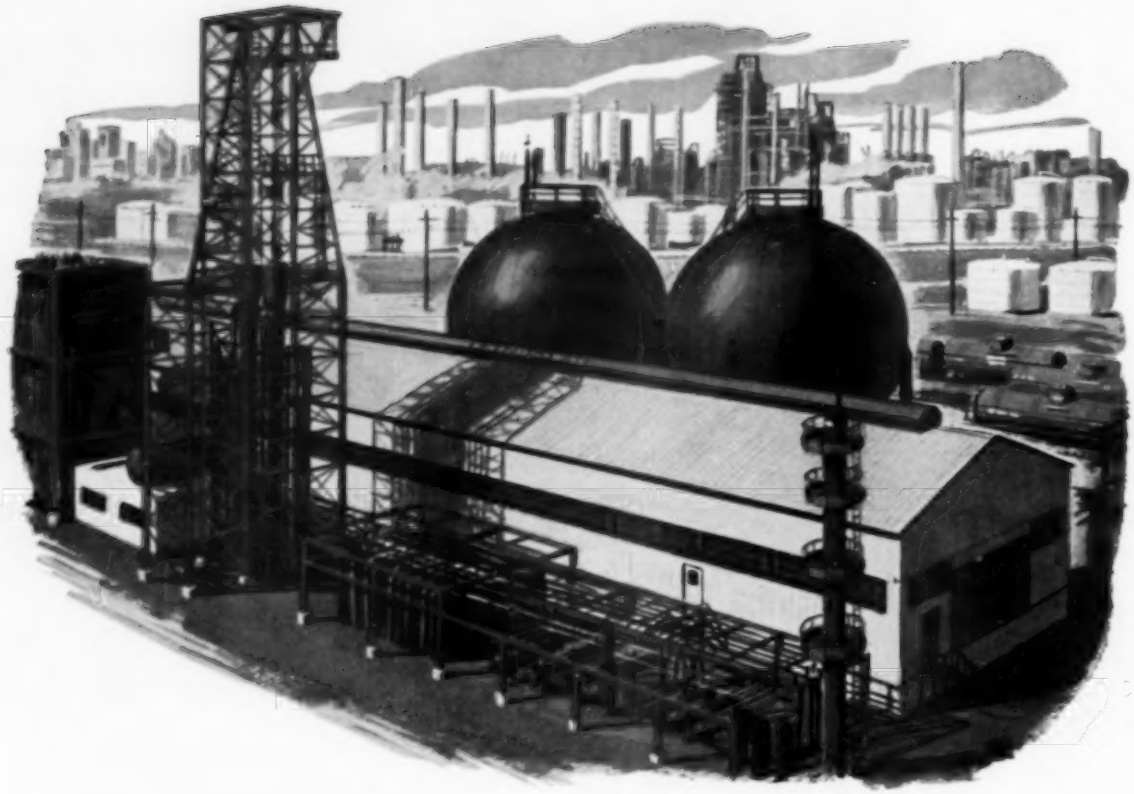

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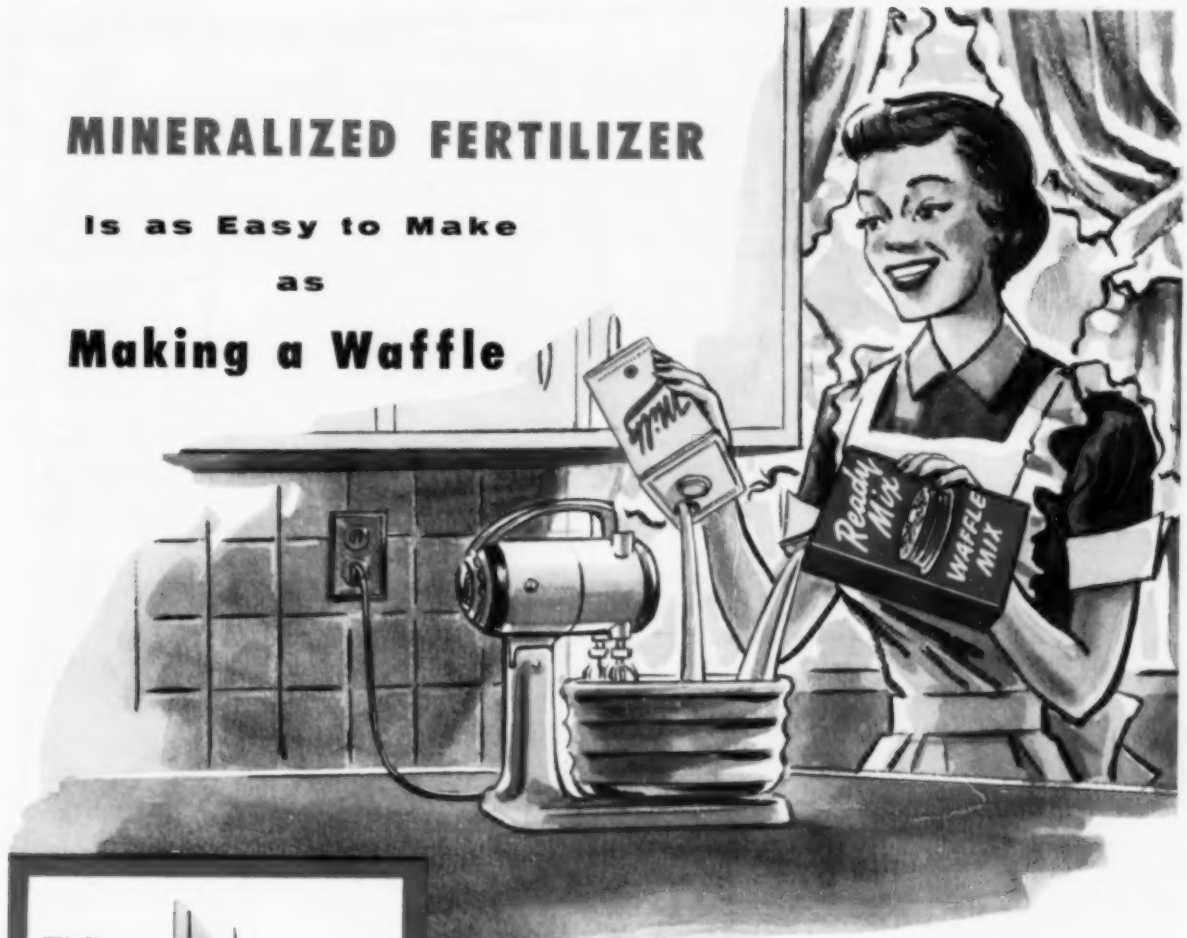

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Editorial
COMMENTS

THE steady increase in facilities for production of anhydrous ammonia over recent years, coupled with failure of demand to keep pace with this rapid expansion over the past year or two, has reached the stage where 1955 will almost inevitably see an over supply of this important fertilizer material which has experienced such a remarkable growth in use in recent years.

There are, of course, two means of establishing balance in such a situation,—cutting the supply or increasing the demand, and the second solution is greatly to be perferred. As a matter of fact such a program is already under way (see pgs. 49-50) and merits the enthusiastic support of all connected with this profitable, dynamic field. However, we believe it is definitely time to pause and take stock,—to recognize some of the limitations as well as the merits of anhydrous ammonia as a fertilizer material. Producers of anhydrous would do well to keep clearly in mind that this product supplies only nitrogen, and none of the other essential nutrient elements. It is easily possible, for example, by excessive use of anhydrous ammonia to get a much larger growth of vegetation under way than can be brought to a successful harvest. Most of the older forms of nitrogen supply additional elements that are often needed to balance the plant food supply in the soil.

The use of such large amounts of nitrogen as are now widely applied to soils is a very new practice. As rates of application are stepped up to ever higher levels, the problem of keeping the nutrient supplies balanced in the soil becomes ever more troublesome. It behooves the anhydrous ammonia industry to find the practical answers to the questions which the use of their product raises.

Perhaps a partial answer may be found in "enriched" liquid fertilizers. Certainly the whole problem requires considerably more study. And the dangers of looking to anhydrous ammonia as a quick, easy solution to the whole fertilizer problem,—a "cure-all",—are clearly evident.

WHO'S ahead in the unceasing battle between man and insect for our joint food supply? Entomologists pause occasionally to take stock. They did just this last month at the annual ESA meeting, and came up with some interesting summaries of recent scoring efforts.

A number of new pests, or at least pests new to the U. S., have come on the scene recently. The Khapra Beetle is one example, the pink bollworm another comparatively recent major threat to our cotton crop. Other pests, long established, show current signs of spreading to new areas. The recent finding of white fringed beetle in south Jersey, the first time it has been noted this far north, is an example of the type danger to which we must be constantly alert, and an illustration of the continuing importance of our insect survey services, which must warn us in time and give us an opportunity to take preventive measures.

But there have been scores this past year on our side too. Systemics show much promise as we learn better how to employ them. Recent studies indicate that they break down so rapidly, if applied at reasonable periods before crop harvest, that residues are essentially non-toxic. Thus they may be used without hazard. Comparatively non-toxic phosphate insecticides are promised as an early future development.

(*Continued on Page* 131)

Dieldrin, Aldrin & Lindane
SYSTEMIC INSECTICIDES
Against Livestock Pests

By W. E. McGregor,* R. D. Radeleff,** A. V. Clabaugh* and R. C. Bushland*
USDA, Kerrville, Texas

FOLLOWING the report by de Toledo and Saur (1950) that benzene hexachloride showed a systemic effect against *Dermatobia hominis* (L., Jr.), a number of chlorinated hydrocarbons were tried as systemics for animal treatment at Kerrville, Texas. In another paper McGregor *et al.* (1954) described tests with phosphorus insecticides and mentioned some unpublished experiments with chlorinated hydrocarbons. This paper describes those experiments, which were conducted at Kerrville during 1952 and 1953.

BECAUSE the screw-worm (*Callitroga hominivorax* (Cqrl.) feeds in the larval stage on living animal tissues and has a short life cycle, it was hoped that indications of insecticidal effect against that species might also apply to cattle grubs. (*Hypoderma lineatum* (De Vill.) and *bovis* (Deg.) It is expensive and time-consuming to test systemic insecticides on cattle naturally infested with cattle grubs because the host animal is costly to maintain and the insect requires several months to complete its larval development. Therefore, the screw-worm was used as a screening insect so that as many treatments as possible could be tried with a minimum of expense.

For preliminary tests, guinea pigs were given hip wounds and artificially infested with newly hatched screw-worm larvae from the laboratory colony. When the larvae were 24 hours old, the candidate insecticides, dissolved in either peanut oil or Tween 20 (polyoxyethylene sorbitan monolaurate), were administered subcutaneously. The preferred solvent was peanut oil, since it caused less tissue damage, but materials not sufficiently soluble in peanut oil were administered in Tween 20.

If the screw-worm larvae died following a subcutaneous injection, the wound was reinfested with newly hatched larvae to obtain indications of the duration of insecticidal effect. Insecticides tried by this method were dieldrin, aldrin, lindane, endrin, isodrin, methoxychlor, chlordane, toxaphene, DDT, TDE, heptachlor, and Q-137. Only the first five showed insecticidal effects. The other materials were therefore not tried further. Detailed studies were limited to dieldrin, aldrin, and lindane.

Tests Against Screw-worms in Cattle

TO check on whether the insecticides were as effective against screw-worms when administered to cattle as they were when given to guinea pigs, ten Jersey steers were artificially wounded and infested with newly hatched larvae. When the larvae had grown in the wounds for a day, three of the animals were given dieldrin, four aldrin, and three lindane, all at different dosages. The lowest dosages of dieldrin and aldrin appeared to have no effect, as the larvae completed their growth in the wounds, dropped to the ground, transformed to pupae, and emerged

* Entomology Research Branch.
** Animal Disease and Parasitic Research Branch.

as apparently normal flies. The two higher dosages of dieldrin, the three larger dosages of aldrin, and all lindane treatments killed the initial infestations. The duration of insecticidal effect was tested twice weekly by reinfesting the wound with newly hatched larvae. It was noted that when the larvae were first able to establish and grow in a treated host, the insects were not able to complete the pupal period and emerge as flies.

The results are summarized in Table 1. To explain these data, the tests with dieldrin are discussed: Dieldrin in a 5-per cent peanut oil solution was injected subcutaneously into the neck region of three steers. Screw-worm larvae growing in a wound and one day old at the time the host was treated were not affected by a dosage of 5 mg./kg. The larvae continued to grow normally; they dropped from the wound after five more days, transformed to pupae, and eight days later emerged as normal flies. At 10 mg./kg. dieldrin killed the larvae in the wound at the time of treatment. Twice each week thereafter the scab on the wound was removed and newly hatched larvae were placed therein. Larvae introduced as late as the nineteenth day were unable to complete their growth. However, on the next trial the larvae survived and completed their development but were not able to complete the pupal stage. Larvae introduced as late as the thirty-third day died during the pupal stage, but larvae placed in the wound on the next trial completed their development and emerged as apparently normal flies. The results with 25 mg./kg. of dieldrin were similar, except that the toxicity to both larvae and pupae lasted one week longer.

TABLE 1

Residual toxicity to screw-worms of single subcutaneous injections of insecticides administered to cattle.

Treatment (mg./kg.)	Days after treatment when life cycle was interrupted as — Larvae	Pupae
Dieldrin		
5	0	0
10	19	33
25	26	40
Aldrin		
5	0	0
10	12	26
25	16	30
50	24	38
Lindane		
10	6	20
25	19	33
50	16	30

Aldrin appeared less effective than dieldrin, in that 50 mg./kg. was about equivalent to 25 mg./kg. of dieldrin, and 25 mg./kg. had about the same effect as 10 mg./kg. of dieldrin.

Lindane was not as persistent as aldrin or dieldrin. Furthermore, with lindane there appeared to be no difference in duration between dosages of 25 and 50 mg./kg., as the animal given 25 mg./kg. remained toxic to screw-worms three days longer than the one treated with 50 mg./kg.

TABLE 2

Effect on *Hypoderma lineatum* of subcutaneous injections of insecticides made at 28-day intervals.

Treatment (mg./kg.)	Number of grubs per animal	Number of insects Died in cyst	Pupated	Emerged
Six treatments beginning two months before grubs migrated				
Lindane 50	0, 9, 20, 29	58	0	0
Dieldrin 25	1, 7, 11, 22	34	7	0
Aldrin[1] 50	4, 5, 12	19	2	0
Control	8, 28	7	29	21
Four treatments beginning after grubs first appeared in the backs				
Lindane 50	18, 20	29	9	2[2]
Dieldrin 25	7, 33	33	7	0
Aldrin 50	16, 182	187	11	0
Control	13, 13, 14, 45	11	74	52

[1]Treatments discontinued after the third injection.
[2]Both flies were abnormal and died shortly after emergence.

Tests Against Cattle Grubs

THE screw-worm data in Table 1 suggested that dieldrin at 25 mg./kg. and aldrin and lindane at 50 mg./kg. rendered the host insecticidal for approximately 30 days after subcutaneous injection. Toxicological studies had indicated that those doses given at monthly intervals would be about the maximum that the cattle could tolerate (Radeleff *et al.* 1953).

In the vicinity of Kerrville, larvae of *lineatum* are found encysted underneath the skin of the back of cattle from August until December and are most numerous during September and October. It was not known in which stage the cattle grubs were most susceptible. To check on the susceptibility of first-instar larvae, one group of cattle were treated two months before the larvae were due to migrate to the back region and molt to the second instar. A number of yearling calves of mixed breeds from ranch herds were randomly selected for this treatment.

Beginning in July the animals, in groups of four, were given subcutaneous injections at four-week intervals over a period of 24 weeks. One animal died of poisoning after the third injection with aldrin; so treatment with that insecticide was discontinued. The cattle were examined each week, and as grubs appeared in the back their numbers and locations were noted. In the control cattle and some of the treated cattle the grubs grew normally, and when it was time for them to migrate from the cysts the cattle were confined in individual screened stalls with concrete floors. The grubs were picked up off the floor and held on damp sand at 80° F. for pupation and fly emergence.

Another group of ten cattle were saved for treatments to begin after grubs were already in the back. The animals were treated in pairs, and four were used as controls. When the grubs grew in the cysts, the cattle were placed in concrete-floored stalls

and the grubs were handled as in the previous tests. The results of these tests are summarized in Table 2.

About as many grubs appeared in the backs of animals injected two months before migration as were found in either the control cattle or those treated after grubs were in the back. Therefore, it seemed that early treatment had no effect on the first-instar larvae. All three insecticides used after the grubs were in the back were completely effective. Most of the grubs died in the cysts. A few pupated, but in only one case did flies emerge and they shortly died. These flies came from grubs that were already in the third instar when the host was first treated with lindane.

Although the dieldrin, aldrin, and lindane had no effect on late first-instar larvae, there was still the possibility that smaller first-instar larvae might be affected. To test this point, 16 Hereford calves from the laboratory ranch herd were treated during April in groups of four, at the same dosages used in the earlier tests. Beginning in August grubs began to appear in the backs of all those calves, and the grubs continued to encyst into October. The number of grubs encysted in the back of each animal are given below:

Dieldrin	4,8,22,26
Aldrin	10,10,13,13
Lindane	6,12,14,24
Controls	1,4,14,22

It seems evident that injecting the calves in April did not affect their grub infestations.

To determine whether *bovis* was also susceptible to the insecticides, ten *bovis*-infested cattle were purchased in central South Dakota and trucked to the Kerrville laboratory for treatment. The first injections were made on February 19, 1953, at which time all the cattle had some second-instar grubs encysted in their backs. Grubs continued to appear in the backs during the next two months. Four of the cattle were given only single treatments, another group of four were treated with the same insecticides three times at 28-day intervals, and two served as untreated controls.

The cattle were observed twice weekly, and when it was time for the grubs to migrate small screen cages were glued over the holes to trap them. The grubs were held in screen-covered jars on damp sand at 80° F., until they emerged as flies.

The results are summarized in Table 3. It will be noted that 40 flies were reared from the 68 grubs that had appeared in the backs of the two control cattle. All the treatments caused a high mortality of grubs or pupae, but aldrin was the only one that was completely effective.

Although not more than three injections were given instead of four or six as in the tests against *lineatum*, since they were given at the same intervals as long as grubs were in the back, the same effects would be expected if the two species were of equal susceptibility. Since a few apparently normal *bovis* flies were reared but no normal *lineatum* survived similar treatments, *bovis* was somewhat more resistant to the treatments with lindane and dieldrin.

Toxicity to Cattle

ONLY one cow was poisoned by these injections, and that was a yearling which died after the third injection of aldrin ot 50 mg./kg.

When yearling Herefords were given 25 mg./kg. of aldrin, dieldrin, or lindane orally in a 5-per cent emulsion, the animals died within 5 hours. Oral treatments are therefore out of the question, since the amount required for insecticidal effect approaches that lethal to cattle.

Fat Contamination

BEFORE systemic insecticides can be used for the treatment of cattle intended for slaughter, the problem of meat contamination must be considered. To obtain an estimate of the amount of insecticide that is stored in the fat, samples were taken by biopsy from some of the cattle used in these experiments. The results of these biopsies are shown in Table 4.

The tendency for dieldrin and aldrin to persist much longer than lindane has been noted in other investigations. Lindane is therefore the preferred insecticide for use in circumstances where a systemic treatment of animals is considered feasible. Even lindane so administered remains as an objectionable fat contaminant for more than a mnoth.

(*Continued on Page* 123)

TABLE 3

Effect on *Hypoderma bovis* of subcutaneous injections of insecticides

Treatment (mg./kg.)	Number of injections	Number of insects Encysted	Pupated	Emerged
Lindane 50	1	15	3	2
	3	8	2	2
Dieldrin 10	1	22	5	3[1]
	3	15	7	2[2]
25	1	25	5	2
	3	24	4	2[2]
Aldrin 50	1	17	0	—
25	3	21	3	0
Control	—	27	21	17
	—	41	33	23

[1]Two flies deformed. [2]One fly deformed.

TABLE 4

Results of biopsies on cattle following injections with insecticides

Treatment (mg./kg.)	Parts per million of insecticide in the fat 28 days after one injection	4 months after four injections at 28-day intervals
Dieldrin 25	44, 70, 155	68
Aldrin 50	75, 93, 175	188
Lindane 25	54	2

Cotton Conference in Dallas

IF no other new pink bollworm infestations are found this year, 1954 will mark the smallest area of spread for this dangerous cotton insect since 1949, when the worm launched its most serious attack on America's cotton crop, reported R. W. White, USDA Pink Bollworm Control Project, at the eighth annual Beltwide Cotton Insect Control Conference. Some 600 representatives of industry, entomologists, experiment station personnel, pesticide dealers, etc., attended the 2-day session sponsored by the National Cotton Council and held Dec. 2-3 at the Hotel Adolphus, Dallas, Texas.

Highlighting the meeting was the annual report on the recommended dosages for the principal insecticides and miticides used in control of certain cotton pests (see pages 45-46, this issue). Other features included a review of 1954 research in the south and far west, discussion of the pink bollworm situation, insect control in cotton, and a review of significant provisions of public law 518 (Miller Bill).

C. B. Spencer, Texas Cottonseed Crushers Association, presiding at the opening session, emphasized the need for control of cotton insects and reported that cotton insects destroyed cotton and cottonseed valued at $261,000,000 in 1953. "These losses", Mr. Spencer said," indicate it is no longer possible for cotton growers to produce profitably, unless cotton insects are efficiently controlled."

Top Left Photo: R. L. Metcalf, Citrus Experiment Station, University of California; R. J. Both, Hercules Powder Co.; W. W. Allen, Dow Chemical Co., and president National Agricultural Chemicals Assoc.
Bottom Left: H. T. Reynolds, Citrus Experiment Station, University of California; R. C. Gaines, Cotton Insects Section, USDA; G. G. Gibson, Texas Agricultural Extension Service; J. C. Gaines, A. & M. College of Texas; C. M. Beckham, Georgia Agricultural Experiment Station.
Top Right: John Johnston, National Cotton Council; Eugene Butler, The Progressive Farmer, general conference chairman; and Claude L. Welch, National Cotton Council.
Bottom Right: K. P. Ewing, Cotton Insects Section, USDA; C. B. Spencer, Texas Cottonseed Crushers Assoc.; and E. F. Knipling, Entomological Research Branch, USDA.

Left Photo: F. C. Bishopp, Pink Bollworm Research Project; R. W. White, Pink Bollworm Control Project, USDA.

Right Photo: J. D. Fleming, Oklahoma Cotton Ginners Assoc.; R. D. Lewis, Texas Agricultural Experiment Station.

Insect Control Research

REVIEWING recent developments in pink bollworm research, F. C. Bishopp, Pink Bollworm Research Project, advised that experiments indicate this pest may be spread by drifting with the wind, and that the wide spread of this pest in the southwestern part of the United States has been due to naural dissemination and not to man's action. DDT used at 2-3#/acre at 7 day intervals is effective under certain conditions in the control of pink bollworm, he said. However, where other pests, such as the boll weevil, aphid, spider mite, are present, combination sprays are required.

Dr. Bishopp reported that special attention is being given to research for modifying ginning equipment and devising mechanical methods for killing bollworm larvae in the cotton seed. "Heat treatments and fumigation of the seed, as now practiced, are providing safety measures but involve considerable expense and trouble." He also reported that experiments have shown conclusively that the largest number of bollworm moths emerge from cotton bolls left on the soil surface, and, that these tests prove the soundness of the recommendations for early and thorough clean up of crop residue. Endrin, parathion, and heptachlor, applied before the crop residue is plowed under, kill a high percentage of insects on the crop residues.

Biological measures give promise of helping in a major way in the control of insect pests, E. F. Knipling, USDA, observed in a report on "Entomology Research—Past and Future." He said practical ways to utilize disease organisms in controlling pests have already been found, as indicated by the success of milky disease for controlling Japanese beetles and viruses for curbing the alfalfa caterpillar and the European pine sawfly. Further research, he said, is yielding information on other virulent insect viruses and micro-organisms.

The value of parasitic and predatory insects as fighters against crop destroying pests should also not be overlooked. Parasites and predators can play an important role in reducing insect losses with very little cost to the producer, Dr. Knipling reported, adding that more knowledge is needed on the relationship between beneficial and destructive insects "so that we can give the farmer sound advice in the use of insecticides."

The question of why losses to cotton insects still average one bale of cotton in every seven bales produced, was considered by K. P. Ewing, Cotton Insects Section USDA. In the first place, Mr. Ewing said, through extensive education, cotton farmers and others in cotton production have become more insect-conscious. They know more readily how to recognize insects and the harm they do. This has led to more accurate diagnosis and reporting of insect damage. Secondly, cotton is now grown on improved, more fertile land. Usually this land produces a more luscious plant, one which attracts insects over a long period. Consequently, there are more insects and they multiply more rapidly and longer than under less favorable host conditions.

Study of systemic insecticides is the research phase that appears to promise the greatest immediate returns. The seed-treatment method, Dr. Ewing indicated, seems especially adaptable to cotton insect control in the seedling and early fruiting stage. "This method would have many advantages over the conventional spray and dust methods now being used in early-season insect control programs."

Farmer Education Program

IN a panel review of the topic, "Utilizing Press, Radio and TV in Cotton Insect Control", E. Butler, *Progressive Farmer;* L. M. Sparks, South Carolina Agricultural Extension Service; J. N. Roney, Arizona Agricultural Extension Serv.; F. H. Jeter, North Carolina State College; Grady Stiles, farm editor, and J. R. Holmes, KATV, Arkansas, discussed means of disseminating and interpreting insect control recommendations to the farmer.

The importance of publications was stressed by E. Butler who advised that "Printed media are most effective in doing a good publicity job before an infestation hits an area. While publications seldom give the final push causing a grower to spray or dust his cotton, they provide background information and details of a thorough program. A timely reminder from radio and tv completes the program when most needed."

OUTLINING American industry's contribution to agricultural research, W. W. Allen, Dow Chemical Co., and president of the NACA, advised that from three to five per cent of the dollars collected from sales of agricultural chemicals are plowed back at once into research. This amounts to some nine million dollars a year in research for agricultural chemicals alone.

Mr. Allen reported also that in addition to the discovery of new chemicals, industry is concerned with the further research of developing practical means of production and finally, researching the market to de-

termine whether or not the product can be sold profitably.

Richard J. Both, Hercules Powder Co., and a member of the legislative committee of the National Agricultural Chemicals Association, discussed the significant provisions of Public Law 518 (Miller Bill) and advised that chemicals used to control cotton insects will not affect the health of consumers of cottonseed food products if regulations set up by the Food, Drug and Cosmetic Act are followed.

A recent addition to this law, Mr. Both said, is the Pesticide Residue Amendment introduced by Representative A. L. Miller of Nebraska and signed by President Eisenhower on July 22, 1954. The amendment provides for tolerances of insecticides. Mr. Both said that cottonseed food products "will not be considered unsafe by the Act if residues do not exceed the tolerances, so long as they have been removed to the extent possible in good manuufacturing practice" and so long as the concentration of the pesticide in the processed food when ready to eat "is not greater than the tolerance permitted on the raw agricultural commodity."

The speaker emphasized that this amendment makes it doubly important for entomologists to advise farmers on pesticide use and to make no recommendations for chemicals not registered. He also said that if further technological changes create a problem of residues in cottonseed products, the law does provide the machinery to meet any situation that may develop.

In a report on "Promising Developments in Insecticide Research" R. L. Metcalf, University of California, presented a series of slides illustrating results of insecticides research. Dr. Metcalf indicated that systox heated at about 130° is transformed into thio iso systox; that tests on citrus for the effect of sunlight over a period of time showed a rapid transformation of systox to the isomers. Cotton treated with systox and its isomers was tested, and chromatographs showed that systox is transformed so rapidly that it never reaches the leaves; some quantity of the thio isomer however does get into the leaf. Dr. Metcalf reported that a study of the oxidation and decomposition products is not yet complete, and that the final breakdown products are yet to be identified.

Control at Farm Level

HEADING a panel discussion on "Cotton Insect Control at the County and Farm Level", W. A. Ruffin, Alabama Agricultural Extension Service, told conferees that failure to control insects can mean a greater loss to the farmer than his neglect in following any or all of the other good practices recommended for cotton production. Effective insect control, he said, depends on accurate surveys, exact timing of applications, good formulations, proper rate of application and coverage of materials, and in maintaining a good working relationship among all segments of the cotton industry.

Panel member R. L. Huckabee, Texas Agricultural Extension Service, reported that farmers in one county in Texas poisoned 90 per cent of their total cotton acreage against insects during 1954, compared with 15 per cent in 1946, the year of record bollworm damage. He pointed out that extension programs are actually reaching the farmers.

B. W. Frierson, assistant general manager in charge of agriculture, Texas Prison System, advised that insect control has been one of the prime factors in almost tripling cotton yield on acreage planted by the Texas Prison System in recent years. Mr. Frierson reviewed the system of agriculture and insect control followed on the prison farms and pointed out that early season control is part of the pattern. In general, he said, they wait to spray for thrips until the cotton plant has four leaves other than the seedling leaves; then spraying is done at weekly intervals for at least four applications.

Mr. Frierson indicated that the cash expenditures for both poison and plane costs have never been more than $10 per acre. "By knowing the problem each insect presents, by using the control guide and frequently checking his field, a farmer can usually show positively he's smarter than the bugs", he concluded.

Role of Cotton Insect Surveys

AS chairman of a panel discussing the "Operation and Value of Cotton Insect Surveys", Kelvin Dorward, Economic Insect Survey Section, USDA, Washington, D. C., reported that "With colleges, research stations, the extension service,

(L. to R.) C. B. Ray, Rio Grande Valley Farm Bureau; W. M. Wilson, Arkansas Agricultural Extension Service; R. L. Huckabee, Texas Agricultural Extension Service; W. A. Ruffin, Alabama Agricultural Extension Service; W. L. Roark, Louisiana Agricultural Extension Service; and B. W. Frierson, Agricultural Dept., Texas Prison System.

(L. to R.): A. G. Bennett, Mississippi Agricultural Extension Service; Kelvin Dorward, Economic Insect Survey Section, USDA; C. R. Jordan, Georgia Agricultural Extension Service; J. T. Conner, Jr., Taylor Chemical Co.; F. M. Fuller, Texas Agricultural Extension Service; J. N. Roney, Arizona Agricultural Extension Service; and Mr. Hardy.

and other agencies continuing to train and develop insect survey entomologists, the effectiveness of surveys in fighting cotton insects will keep growing".

C. R. Jordon, Georgia Agricultural Extension Service, advised that by stimulating cotton farmers to check their own fields for insects, the USDA insect survey report has performed its most valuable service. He reported also that early season survey information gives a good indication of weevil potential for the coming season, and that it provides a check on the accuracy of trash examinations made in the early spring.

Also participating in the discussion, F. M. Fuller, Jr., Texas Agricultural Extension Service, reported that during the past season in Texas boll weevils survived the 1953-54 winter in large numbers, with an average weevil population of 105 per acre being recorded in June. A peak of 45 weevils per acre was reached in Oklahoma the same month, he said and added that the cotton insect surveys have proved of great help in the fight to curb cotton pest damage.

A. G. Bennett, of the Mississippi Agricultural Extension Service also reported a favorable response to the insect surveys and suggested that these be expanded to meet the challenge of higher cotton yields on less acreage. Mr. Bennett reported that the surveys have proved valuable in pointing to "hot spots" that develop on the insect front, such as information on when leaf worms, army worms and other pests are likely to become a problem. At the same time, the surveys enable dealers to keep supplies of insecticides on hand when needed.

FULL attendance at the session reviewing 1954 research highlights emphasized the strong interest of the cotton conference in these reports. The following summaries review some of the points of discussion:

Southeast Report by C. M. Beckham, Georgia Agricultural Experiment Station.

The outstanding developments and the phases of cotton insect control of most interest during the 1954 season were the performance of certain organic phosphates as systemics against bollweevil, thrips, aphids and spider mites; the effectiveness of endrin dust as a near all-purpose cotton insecticide; the cooperative BHC project to determine the possible resistance of aphids to this material and to compare the relative effectiveness of "low" and "hi" gamma BHC formulations; and the further evaluation of miticides for control of spider mites on cotton.

In North Carolina, Compounds 12008 and 12009 applied to cotton seed at the rate of 4 pounds of active material per 100 pounds of seed showed promise as systemics for boll weevil control. Eight weeks after planting the seeds, treatments showed zero punctured squares while the untreated check had 10 per cent infestation.

Although endrin as a spray has not been recommended in many states for the past several years, a stable dust has not been available for general testing until 1954, during which year endrin dust was found to be equally effective as the spray at a comparable dosage for boll weevil and bollworm control. Since endrin dust will not control spider mites, however, it will be tested in combination with sulfur and other miticides next season.

Spider mite control studies in South Carolina showed that demeton, OMPA, OMPA and parathion combined, and OMPA and TEPP combined, at different dosages, gave good initial kill. In a field test, one application of 1 per cent parathion, 4 per cent diazinon, 20 per cent ovotran, and 4 per cent malathion dusts failed to give satisfactory control of *T. bimaculatus*.

Sulfur failed to control *Tetranychus desertorum* and *T. altanticus* in 3 tests in Alabama. Excellent control resulted from use of parathion, malathion, and methyl parathion as dusts and sprays. Aramite also gave good control of both species. Chlorthion spray when used throughout the season, failed to give satisfactory suppression of an undetermined species of spider mite in Georgia.

Compound 4124 was field tested as a foliage application in South Carolina. A 10 per cent dust failed to give satisfactory control of bollweevils and bollworms when the infestations were moderately heavy. When tested as emulsion sprays, there was no significant difference between treatments of Compound 4124, BHC-DDT, and chlorthion-DDT with respect to boll weevil or bollworm control. However, Compound 4124 gave significantly greater yield in pounds of seed cotton.

Mid-South Report by R. C. Gaines, USDA.

Data obtained from experiments conducted during 1954 in Arkansas, Tennessee, Mississippi and Louisiana showed that BHC-DDT mixtures formulated from low gamma and high gamma BHC concentrates were equally effective in control of the boll weevil. Endrin dusts were as effective as sprays. Compounds 12008 and 12009 applied as sprays at the rate of .25 and .29 pounds per acre and chlorthion applied at the rate of .36 pounds per acre did not give satisfactory control. Strobane when applied at the rate of 2.8 pounds in a dust and at the rate of 2.5 pounds in a spray gave good control. DDT in combinations and endrin alone gave good control of the boll worm.

Sulfur was as effective as parathion or aramite in control of spider mites. Outstanding control of mixed infestations of spider mites was obtained with demeton, parathion, Compounds 12008 and 12009, and AC 528.*

Compounds 12008 and 12009 in activated charcoal were used as seed and as soil treatments against thrips. They gave good control of thrips for as long as two weeks when applied to the soil at the rate of one and one-third pounds per acre and at the rate of four pounds per 100 pounds of seed. Cotton stands were reduced where planting seed was treated with Compounds 12008 and 12009.

*Manufactured by Bayer

Far West Report by H. T. Reynolds, University of California.

Of several leaf hopper species of the genus *Empoasca*, common on western cotton, *Empoasca fabae* is readily controlled with DDT; parathion and malathion give excellent results on *E. solana*, although the residual activity is short; and perthane and Systox are very promising for control of the latter pest.

DDT alone is not adequate for control of the cotton leaf perforator, *Bucculatrix thurberiella*, however excellent results are obtained with endrin or toxaphene-DDT combination.

Insofar as insecticides are concerned, DDT is still the most effective single material. The addition of toxaphene to DDT apparently gives a longer residual period of control and the combination is used widely in Arizona and the southeastern desert areas of California because it gives excellent control not only of boll worms, but salt marsh caterpillars, cabbage loopers, and cotton leaf perforators as well. In addition, the toxaphene-DDT combination gives a better kill of lygus bugs than does DDT alone. Endrin sprays at .4 to .5 pounds per acre in general give about the same results as the DDT-toxaphene combination for the same range of pests.

Southwest Report by J. C. Gaines, A & M College of Texas

A new cotton pest, the brown leafworm, developed in damaging numbers in certain parts of Texas in 1954. The damage appeared first as small "buck shot" holes in the cotton leaves, which became larger as the larvae continued to feed. Plants in some cases were completely defoliated, and where severe infestations existed the fruits were attacked. Parathion was found effective in control of this pest. Parathion was also found effective in the control of leaf miners; however, it is doubtful that chemical control of this pest on cotton will prove profitable.

(*Continued on Page 125*)

Preliminary Report on Commercial

FERTILIZER CONSUMPTION

for the Year Ended June 30, 1954

By Walter Scholl, Hilda M. Wallace and Esther I. Fox

Fertilizer and Agricultural Lime Section
Soil and Water Conservation Research Branch
Agricultural Research Service
U. S. Department of Agriculture
Beltsville, Maryland

FOR the year ended June 30, 1954, a preliminary estimate indicates that use of commercial fertilizer in the United States and Territories (Hawaii, Puerto Rico, and Alaska) amounted to 22,875,000 short tons, a decrease of 538,000 tons or 2.3 per cent, from the quantity used in 1952-53. Consumption of commercial mixtures amounted to 15,675,000 tons, materials containing primary plant nutrients (N, P_2O_5, K_2O) for direct use to 6,620,000 tons, and secondary and trace element materials to 580,000 tons. These quantities were, respectively, 0.3, 2.8, and 33.9 per cent below the consumption in 1952-53. The total tonnage of fertilizer used in July-December, 1953 was approximately 18 per cent less than in the corresponding period of 1952, while the tonnage used in January-June 1954 was 4 per cent more than in the corresponding period of 1953.

Regionally, the total consumption of fertilizer east of the Mississippi River was 2 to 7 per cent less than in 1952-53 (Table 1), whereas it was up to 7 per cent more in the area west of the Mississippi. Consumption in the territories was 7 per cent more than in 1952-53. Increases in the consumption of mixed fertilizers (2 to 18 per cent) occurred only in the Middle Atlantic, West North Central, and Pacific regions and the Territories. The tonnage of materials for direct use was higher (2 to 10 per cent) only in the West North Central and Mountain regions and the Territories.

Consumption of primary plant nutrients amounted to 5,851,000 short tons (Table 2). This was an increase of 203,000 tons, or 3.6 per cent over the quantity in 1952-53. The increase in nitrogen was 173,000

(*Continued on Page* 116)

TABLE 1

Preliminary estimate of fertilizer consumption, year ended June 30, 1954[1]

Region	Mixtures	All fertilizers[2] Quantity	All fertilizers[2] Relative consumption 1952-54 = 100
	1,000 tons	1,000 tons	Percent
New England[3]	365	435	93
Middle Atlantic[4]	1,850	2,080	98
South Atlantic[5]	4,990	6,095	97
East North Central[6]	3,685	4,870	95
West North Central[7]	1,350	2,235	107
East South Central[8]	2,025	3,080	97
West South Central[9]	715	1,395	99
Mountain[10]	65	385	106
Pacific[11]	350	1,900	94
Continental U. S.	15,395	22,475	98
Territorial[12]	280	400	107
Total: 1953-54	15,675	22,875[13]	98
1952-53	15,722	23,413[13]	100
1951-52	15,086	22,432[13]	96

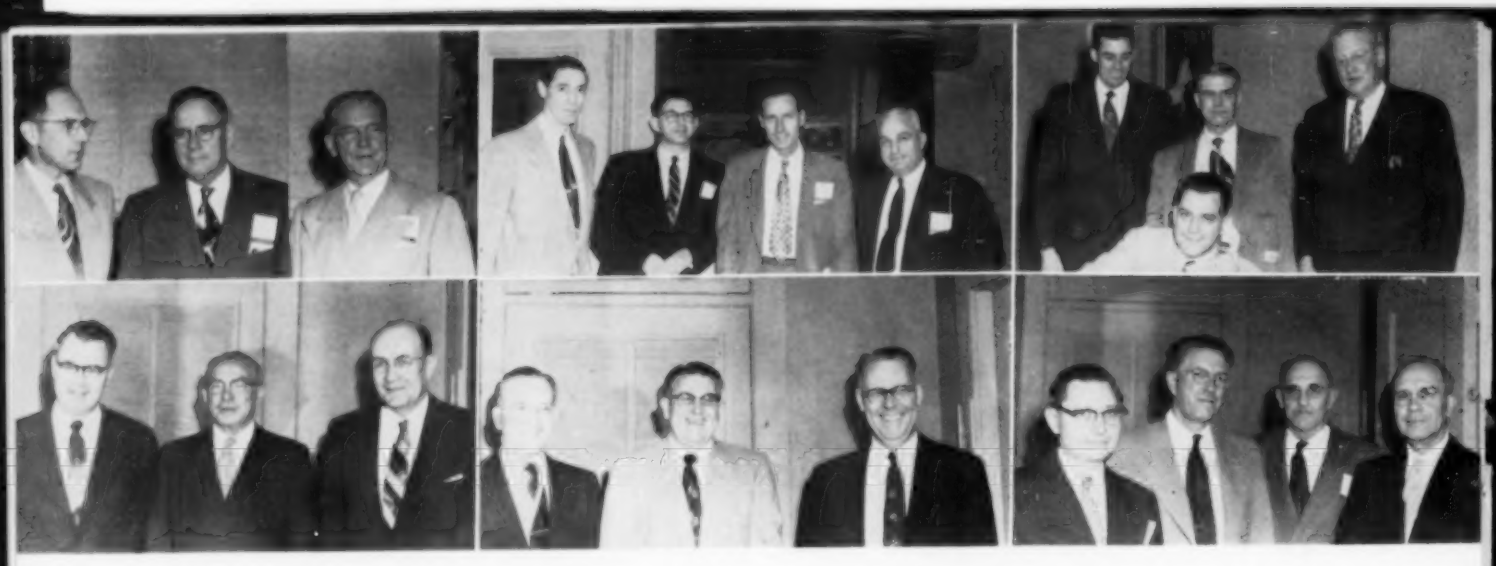
1 Includes fertilizers distributed by government agencies.
2 Includes mixed fertilizers, primary nutrient materials used directly, colloidal phosphate and phosphate rock, basic slag, processed manures, sewage sludge, secondary and trace element materials. Does not include liming materials, but includes gypsum.
3 Maine, N. H., Vt., Mass., R. I., Conn.
4 N. Y., N. J., Pa., Del., D. C., Md., W. Va.
5 Va., N. C., S. C., Ga., Fla.
6 Ohio, Ind., Ill., Mich., Wis.
7 Minn., Iowa, Mo., N. D., S. D., Neb., Kan.
8 Ky., Tenn., Ala., Miss.
9 Ark., La., Okla., Tex.
10 Mont., Idaho, Wyo., Colo., N. Mex., Ariz., Utah, Nev.
11 Wash., Oregon, Calif.
12 Hawaii, P. R., Alaska.
13 Materials not guaranteed to contain N, P_2O_5, or K_2O included in 1953-54 totals, 580,000 tons; in 1952-53, 877,487 tons, and in 1951-52, 785,050 tons.

TABLE 2

Preliminary estimate of primary plant nutrients contained in all fertilizers and average nutrient content of mixtures, year ended June 30, 1954

Region	N 1,000 tons	Available P_2O_5[1] 1,000 tons	K_2O 1,000 tons	Total Nutrients Quantity 1,000 tons	Total Nutrients Relative consumption 1952-53 = 100	Weighted percent in mixtures percent
New England	26	44	47	117	93	28.4
Middle Atlantic	110	238	186	534	101	26.4
South Atlantic	378	473	468	1,319	99	22.0
East North Central	266	534	584	1,384	103	31.7
West North Central	234	331	155	720	116	35.4
East South Central	267	284	210	761	101	23.6
West South Central	164	151	92	407	105	26.3
Mountain	69	58	3	130	115	29.9
Pacific	240	94	31	365	110	27.2
Continental U. S.	1,754	2,207	1,776	5,737	104	26.7
Territorial	56	20	38	114	104	28.9
Total: 1953-54	1,810	2,227	1,814	5,851	104	26.8
1952-53	1,637	2,271	1,740	5,648	100	25.9
1951-52	1,422	2,199	1,582	5,203	92	24.9

1 Includes 2 per cent of the colloidal phosphate and 3 per cent of the phosphate rock marketed for direct application, as available P_2O_5.



ESA ELECTS

SYSTEMIC insecticides were very much in the spotlight at the annual meeting of the Entomological Society of America, held December 6-9, in the Rice Hotel, Houston, Texas. Featured on the program was a symposium on systemic insecticides for control of insect pests of animals, which attracted much interest. The concensus of the panel was that eventually a solution will be found which will permit safe use of systemics by cattle raisers, but that such a goal is still one for the future. A new systemic for use on cotton was described as showing considerable promise in one paper, while in another discussing residues which remain following use of systemics it was reported that, at usual rates of application the systemics break down so rapidly that residues are inconsequential.

George C. Decker was elected president of the association for the coming year, succeeding Herbert H. Ross. The new president-elect for the coming year is B. A. Porter.

The 1955 convention of the society will be held at the Netherlands Plaza, Cincinnati, Nov. 29-Dec. 2, 1955. The 1956 meeting will be held in New York City at the Hotel New Yorker, during the week between Christmas and New Years, concurrently with the AAAS meeting. For 1957 the choice of meeting place, to be made at next year's convention, will be between Memphis, Atlanta and Jacksonville.

Opening the program, H. H. Ross of the Natural History Survey, Champaign, Ill., retiring President of E. S. A., observed that the science of entomology sends its roots into all other scientific fields and must draw from them many of the ingredients needed for its own growth. In view of this interdependence of the sciences, Dr. Ross urged that all entomologists become familiar with the general scientific fields which border their own specialties. He also called for some return lease-lend. Since entomology has accepted much aid from the more general or basic sciences, he suggested that entomologists keep in mind the necessity for paying some of this debt. The following specific suggestions were offered: (1) that entomologists increase the exchange of ideas between the various specialized fields of entomology; (2) that they develop a more extensive system for bringing information from other branches of science into entomology and (3) that many more entomologists integrate the findings of entomology into the respective basic and synthesizing branches of science.

All entomologists, he concluded, should learn enough about other fields so that they will be able to recognize entomological data pertinent to them and to integrate these data into the proper fields.

Entomology and the Future

P. J. Chapman, of the Department of Entomology, New York Agricultural Experiment Station, Geneva, New York, discussed "Entomology and Its Future". For the future, he predicted, we must continue to rely heavily on chemicals for control. However, he reminded, that chemicals are not an unmixed blessing, since they present hazards to human health, and are becoming more and more costly because of the multiple spray programs now necessary. He also listed as other disadvantages connected with chemical control the development of resistant strains of insects, the destruction of predators and the build-up of toxic insecticide residues in the soil. Illustrating his second point, he observed that currently in New York State it costs in the neighborhood of $100 an acre to control insect pests in apple orchards, with some 20 spray schedules being necessary. Costs for protection of citrus in California are at about the same rate, he added.

Photos, Facing Page:
Top Left: Retiring president H. H. Ross; president-elect B. A. Porter; and newly elected president George C. Decker. Top Center: George Ferguson and H. E. Alexander, both of Geigy Agricultural Chemicals, New York; E. F. Knipling, USDA; and J. E. Bussart, Velsicol Corp. Top Right: H. E. ("Skip") Meadows, Diamond Alkali Co., Houston, member of the arrangements committee; C. C. Compton, Shell Chem. Corp., Denver; Sherman W. Clark, Texas Gulf Sulphur Co., Houston, local arrangements committee; and (foreground) Gus Garon of Shell, Houston, chairman of the local arrangements committee. Bottom Left: J. W. Apple, University of Wisconsin; Roy Campbell, USDA, Whittier, Calif.; and P. J. Chapman, N. Y. Agr. Exp. Sta., Geneva, N. Y. Bottom Center: Harold H. Shepard, USDA, Washington; H. M. Harris, Iowa State College, Ames; and Reginald H. Painter, Kansas State College, Manhattan. Bottom Right: Dr. Carroll N. Smith, USDA, Orlando, Fla.; Dr. N. D. Farrar, dean of the College of Agriculture, Clemson, S. C.; J. G. Gaines, head, Dept. of Entomology, Texas A. & M.; and F. W. Poos, USDA, editor of the "Journal of Economic Entomology."

Photos on This Page:
Top: Neely Turner, Conn. Agr. Exp. Sta., New Haven; W. J. Gehweiler, R. T. Vanderbilt Co., New York; Robert Glen, Chief of Entomology Div., Canada Dept. of Agriculture, Ottawa; David G. Hall, USDA, Washington; and R. L. Beard, Conn. Agr. Exp. Sta. Bottom: I. L. Toler, Wilson Toler & Co., Houston; L. K. Brunn, Atlas Powder Co., Wilmington; C. M. Meadows, S. W. Sprayer & Chem. Co., Waco, Texas; and J. H. Dunton, S. W. Sprayer.

DECKER

Commenting on possible future developments in the insecticide field, he noted that it may be more fruitful to develop products of higher rather than lower toxicity, since it is less hazardous to employ a low concentration of a highly toxic material rather than a larger volume of a less toxic insecticide.

He reminded that all chemicals can be toxic and yet none need be if properly employed. The ideal situation, he added, will be to employ chemical controls only to supplement biological control. The future, he suggested, may involve more restrictions on the use of chemicals, restricting their use only to certain seasons of the year so the natural controls may be safeguarded. He also suggested wider employment of systemics in the future.

Lester English of the Illinois Natural History Survey, Champaign, Illinois, also dealt with some of the basic theories underlying current pest control practices, in an invitational paper in which he called attention to "the need for common sense in controlling insect pests". He raised the inevitable question as to whether or not we are making progress in insect control when widespread applications of potent insecticides such as DDT simply lead to increased infestations of alternate pests such as mites, aphids and scales, leading to the inevitable need for more and more controls. He called attention also to such problems as the development of resistant species, toxicity hazards and the increasing preoccupation of entomologists with the routine work of testing one product after another.

While admitting that there is no simple answer to these problems which face the profession and the commercial phase of entomology, he did offer a few suggestions. He warned against going ahead blindly with new materials without anticipating the hazards and the problems that they might present. Development of resistance should be anticipated and guarded against. He cautioned on the use of insecticides and fertilizers in combination, suggesting rather that they be applied separately but simultaneously.

Additional answers to these problems, he suggested, might be found in the coordination of use of chemicals with other natural controls. Proper timing of chemical applications to safeguard predators, better control of dosages, and use of materials and dosages which will not destroy natural parasites. He also suggested that industry concentrate on the development of materials which will be more specific in their action and effective in much smaller quantities.

Pesticidal Effect on Flavor

EFFECTS of Insecticides on Flavor and Quality of Product" were discussed in a paper by Victor R. Boswell of the Horticultural Crops Research Branch, U. S. D. A., read in his absence by Bailey Pepper of Rutgers University, New Brunswick, N. J. It is surprisingly difficult and expensive, Mr. Boswell observed, to obtain dependable measures of possible effects of insecticides on flavor and quality. Some direct adverse effects are relatively obscure, are highly variable in their occurrence, or are delayed in their appearance. Delayed effects present the greater difficulties in determination because the factor of time and many additional unknown or uncontrolled variables become involved. Direct effects of insecticides upon quality of products were divided by Mr. Boswell into two classifications: (1) effects of current treatment of the crop harvested and (2) delayed or accumulative effects of residues of insecticides from treatments of preceding crops.

The problem of determining the effects of insecticides on flavor and quality is made more difficult by the fact that there are no adequate stand-

Dr. Charles Palm, Cornell University, Ithaca, N. Y., a past president of ESA, Ed Litooy, Colloidal Products Co., San Francisco, O. B. Hitchcock and Dr. Thomas Snipes, Chemagro Corp., New York, and R. W. Wert of Attapulgus Div., Min. & Chem. Corp.

ards of "normal" flavor of each of the products involved, and there is no adequate way to distinguish many quality factors that are merely different from those that are inferior to the standard. Present methods of testing are far too slow and costly and finally, there is lack of dependable means of ruling out differences that may be caused by some factor other than the insecticide under test.

Mr. Boswell summed up a series of experimental results from studies in general as follows: technical BHC in any form is likely to impart off-flavors or otherwise impair acceptability of products exposed to it; therefore, it should not be used on food crops. Lindane is nearly as bad and is recommended only for certain seed treatments and for control of pickle worm on cucumbers for slicing.

The limited tests on malathion suggest no adverse effects from recommended usage. There is very little in the record against parathion, DDT and analogs of DDT insofar as flavor and attractiveness of product are concerned.

Effects of chlordane and toxaphene have been highly variable, offering no basis for generalizations at this time as to their probable effects on quality. They appear to produce no specific off-flavors, but have some real tendency to interfere with development of optimum quality and flavor, especially when used at relatively heavy rates.

Aldrin and dieldrin are relatively new and have, as yet, few approved applications to food crops. The few data available suggest that they are among the less harmful insecticides to flavor and attractiveness. Because of their high toxicity, however, their use must be carefully restricted.

Systemics For Livestock

THE symposium on use of systemic insecticides for the control of insect pests of animals attracted wide interest. Leading off the symposium was W. S. McGregor of the Entomology Research Branch, Agricultural Research Service, U. S. D. A., who presented a paper co-authored by R. C. Bushland under the title "Entomological Problems in the Development of Systemic Insecticides for Livestock." The development of systemic insecticides for treatment of animals has been under continuous study at the Kerrville, Texas laboratory of the Entomology Reserach Branch since its establishment in 1946. Elsewhere in this issue (See Pages 34-36) results of this work to date are summarized.

In his contribution to the symposium, Mr. McGregor observed that the eventual goal in the development of a systemic insecticide is a treatment sufficiently high in insecticidal efficiency and low enough in mammalian toxicity so that there will be an adequate margin of safety for general use by the farmer. So far, he indicated, that goal has not yet been attained but partial success has been achieved in preliminary test work. Recently, he reported, considerable success has been achieved with oral dosages of phosphorus insecticides which makes treatment much easier than the injection method required for applications of chlorinated hydrocarbons.

In the oral administration of phosphorus insecticides, it was found that chemicals effective against screw worms in guinea pigs also work against screw worms in sheep, but that considerably higher doses are necessary. To kill screw worms in sheep, the minimum dose was found to be approximately 20 mg./kg. A number of insecticides including lindane, dieldrin, aldrin, Dipterex, Diazinon and Chlorthion were effective in killing screw worms in guinea pigs and cattle grubs encysted in the backs of cattle. However, none of these treatments proved effective against first-instar *H. lineatum* larvae.

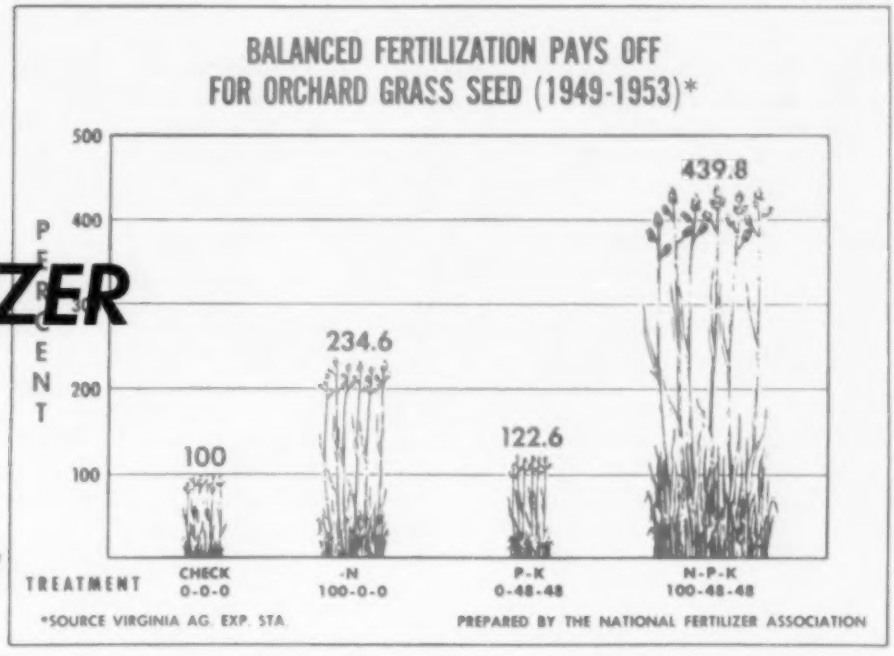
In conclusion, it was suggested that in spite of recent successes with oral dosage of phosphorus insecticides, the development of an insecticide which can be administered by the stock man to his animals either as a drench or mixed with salt or ground feed is still a goal for the future.

Dr. R. D. Radeleff of the Animal Disease and Parasite Research Branch of the Agricultural Research Service of U. S. D. A., Kerrville, Texas reviewed toxicological problems connected with the use of systemic insecticides for control of pests in livestock in a paper co-authored by George T. Woodward. He pointed out that a successful systemic insecticide for use on livestock will enjoy widespread use and will have attractive commercial possibilities. On the basis of three years' work at Kerrville, during which hundreds of animals have been treated and observed,

(*Continued on Page* 110)

D. Earley, Port Fertilizer and Chemical Co., Los Fresnos, Texas; elected chairman of the Southwestern Branch of the ESA; and C. A. King, Jr., Geigy Co., McGregor, Tex., secretary-treasurer of the branch.

FERTILIZER an answer to our farm surplus problem



*By Russell Coleman**
National Fertilizer Association
Washington, D. C.

TODAY, two basic but fundamentally conflicting problems face American agriculture. One deals with the short term—how to live with, or eliminate, farm-produced surpluses. The other deals with the long term—how to produce the increasing quantities of food and fiber that will be needed to feed and clothe our rapidly growing population.

Perhaps both of these problems have been overemphasized. Certainly there has been much talk and entirely too little action. Both are worthy of consideration, in fact, *require serious consideration*. But we *must* solve the short-term problem because it is with us now—today. Insofar as the long-term problem is concerned, I think we all are agreed that commercial fertilizer is the most important tool available to man for producing his future food and fiber needs.

Many solutions have been suggested for solving our farm surplus problem. Perhaps the most common suggestion is that we simply ship our surplus food and fiber abroad to feed and clothe needy people in friendly foreign nations. This would appear to be simple enough because certainly there are millions in the world who are without adequate diets and warm clothing.

But a more realistic appraisal of this suggestion reveals that when we do ship American farm products into other countries we may entirely upset foreign agricultural economies. Our federal government presently is conducting a vigorous campaign along these lines aided by new legislation passed by the last Congress. But it never has been suggested by any responsible government official that this is a complete solution to our farm surplus problem.

During the last session of Congress, one of our enterprising representatives suggested that we simply dispose of our surplus food and fiber in the same way that we dispose of surplus war equipment. This suggestion may have more merit than one might think. There is approximately $60 billion worth of surplus obsolete war equipment, and only about one-tenth that amount of surplus food and fiber.

But American people will not stand for the destruction of food, as witness their reaction to the plowing under of cotton and the "killing of little pigs" during the great depression. This suggestion by a respected Congressman does point up one significant fact, however. Strictly from a money standpoint, America's farm surplus problem is dwarfed by comparison with other surplus problems.

The long-term answer to this short-term problem is simple. It is one which has been advocated for years by your land-grant colleges. More recently, it has found an ardent advocate in the Secretary of Agriculture. It is simply to increase farm production efficiency through the more widespread application of improved farming practices.

The most effective tool within the reach of all farmers to accomplish this objective is the proper use of com-

*Address delivered December 7, 1954 by Dr. Russell Coleman, president, The National Fertilizer Association, Washington D. C., at the meeting of the Agricultural Ammonia Institute, Jung Hotel, New Orleans, La.

mercial fertilizer. Fortunately, proper fertilizer usage also is the key to solution of the long-term food production problem. In the discussion which follows, I would like to emphasize that the information I am presenting is based entirely on the results of research conducted by agricultural experiment stations.

Three basic commodities have been responsible for a large share of the farm surplus headache. These are wheat, cotton and corn. For this reason, I am using these commodities to illustrate my discussion.

A recent study conducted by the Arkansas Agricultural Experiment Station shows that Arkansas farmers could realize as much net profit from a 900,000-bale cotton crop as from the recently produced 1.8 million bales, by using fertilizer according to experiment station recommendations. What's more, they could produce this smaller crop on 900,000 acres instead of the more than 2 million acres devoted to cotton in Arkansas in the past. This would be possible because by using fertilizer at recommended rates, the yield per acre would be substantially increased and the cost of producing each bale of cotton would be drastically reduced.

In South Carolina, Clemson College shows us that farmers' profits from a 400,000-bale crop could be 22 per cent higher than the estimated $18,000,000 profit derived from the the 695,000 bales produced in 1953 in that state. This would mean increasing the yield per acre from the 283 to 500 pounds of lint per acre. Acreage devoted to cotton would simultaneously be cut by 64 per cent. Higher fertilizer usage would be indispensable in achieving this result.

In California, where cotton is grown under irrigation and water is not a limiting factor, average net profit per acre could be increased from $186 to $261 if fertilizer were used at the most profitable rate. Cost of production per pound of lint could be reduced from around 9.5 cents to 7.9 cents.

Recent studies in Missouri and in other States show that this same principle applies to wheat. In Missouri, 30 million bushels of wheat presently are produced on 1½ million acres. If experiment station fertilizer recommendations were followed Missouri farmers could make $3 million more net profit from a 27-million bushel wheat crop which they could produce on only 900,000 acres.

In the State of Washington, the experiment station has shown that the average cost of producing a bushel of wheat can be reduced from the present average of $1.53 on unfertilized land to about $1.00. If Washington farmers can cut their cost of production by more than one-third—thus increasing their profit per bushel accordingly—they obviously can afford to produce a much smaller total wheat crop while maintaining or even increasing their total net income from wheat.

Even on the high producing soils of the corn belt, proper use of fertilizer can cut the cost of producing farm crops. In Ohio the cost of producing corn could be reduced from $1.00 per bushel to 80 cents per bushel. If farmers generally were to adopt fertilizer recommendations, several possibilities suggest themselves. They could increase their income from corn sold at the present price. They could reduce their total output without reducing their net returns. They could even afford a cut of 20 cents in the present support price without losing income from their present crop.

In Missouri, research shows that farmers in that State could make $20 million more profit from 120 million bushels of corn grown with recommended practices than from 140 million bushels grown with inadequate quantities of fertilizer. A total of 1½ million acres properly fertilized would produce this smaller, but more profitable crop, instead of the 4 million acres presently planted to corn in Missouri. Yes — Missouri farmers could realize 25 per cent more net profit from 15 per cent less corn if fertilizers were used as recommended along with other good farming practices.

What would be the result if this practice of properly using fertilizer were applied to *every* American farm?

In the case of cotton, farmers could easily afford to reduce their production from the recent average of 15 million bales to around 9 million bales—a quantity which would be more in line with the domestic market. This could be done without reducing the net return farmers currently realize from their cotton crop.

In the case of wheat—probably our most troublesome surplus problem—the results would be even more astounding. Average net profit per bushel could be approximately tripled —from around 15 cents to 45 cents. This means that the nation's wheat crop could be cut to almost one-third of present production without sacrificing one dollar in net profits at present prices. Thus, the nation's wheat farmers could realize as much net return from 385 million bushels of wheat as they currently realize from about 1 billion bushels. Under these circumstances, our present wheat surplus would quickly be converted into a shortage.

Applying the same principle to corn, we find that the same net profit could be derived from a 2-billion bushel crop as is presently realized from 3 billion bushels.

Obviously, the basic problem confronting American agriculture at present is not so much how to adjust production to demand, but how to do it *without reducing net farm income.* I believe you will agree that if commercial fertilizers were used properly, in accordance with experiment station recommendations, both of these problems could be solved.

Of course we must recognize that some sort of production controls would be necessary to limit total production to requirements. But we already have such controls on the basic commodities, including wheat, cotton and corn, which I have used as examples.

Many of you think that this proposal is academic. Certainly, I would be the first to admit that none of us will see the day when this proposal is completely realized. But just as cer-

(*Continued on Page 127*)

A REVIEW OF SYSTOX

*By Rosmarie von Rümker**
Chemagro Corporation, New York, New York

THE idea of making plants internally resistant to attacking pests or disease has intrigued biologists for centuries. It can be traced back more than four hundred years to Leonardo da Vinci, who believed arsenic to be a promising "systemic insecticide." In the 1920's Adolf Müller (8), working with certain inorganic and organic compounds claimed pyridin to be a plant therapeutant against insects. Hurd-Karrer and Poos (5, 6) in 1936 detected inner-therapeutic effects of selenium on aphids infesting wheat. None of these early observations, however, proved to be of appreciable consequence from the point of view of economic entomology and crop production.

In 1935, systematic research in this field was initiated in the research laboratories of Farbenfabriken Bayer in Leverkusen, Germany, with Gerhard Schrader as project leader (12, 3). Soon after initiation of the program, certain derivatives of beta-fluoroethylalcohol were among the first organic compounds which were found to possess powerful insecticidal action. In 1936, Schrader's interest focussed on organic phosphates. It was soon detected that fluorine was not an essential compound for insecticidal action in the phosphoric acid ester molecule.

The remarkable results which were achieved by Schrader and his group in the course of their systematic investigation of the phosphoric acid ester group in the years after 1936, as well as the various methods used to achieve such progress, have been described in numerous publications. Interesting compounds developed by Schrader in the early stages include bis-dimethyl-amino-fluorphosphine oxide (also known under Schrader's laboratory number 13/28), and octamethylpyrophosphoramide, abbreviated OMPA (also known under Schrader's laboratory number 13/163; German patent application filed August 7, 1941) (9), which was later given the common name Schradan, in honor of its inventor. These two compounds were not released for commercial usage by Farbenfabriken Bayer because they were considered to possess certain undesirable pharmacological and other properties. Subsequently, however, these materials have been commercially developed by other interests.

Schrader's work first became widely known following the end of World War II. Martin and Shaw (7), in a review of Schrader's work up to the end of the war, proposed the term "systemic insecticides" for chemicals which are absorbed and translocated by plants in sufficient amounts to render the plants toxic to insects and/or mites feeding on them. These reports on the work of Schrader and his group stimulated a tremendous amount of chemical and entomological research in many countries, as it became apparent that an entirely new approach to chemical pest control had been developed, shortly after the first chlorinated hydrocarbon insecticides became known.

In 1948, Schrader synthesized diethoxy-ethylmercaptoethylthiophospate, which bore his laboratory number E-1059 (10, 11). The outstanding biological properties of this material were recognized, and its potentialities were first explored at Bayer's experiment station at Höfchen by Günter Unterstenhöfer. The material was first tested under the Bayer code number 8169, has been given the common name demeton, and is widely known under the trade name Systox. The early results of Bayer's research team have been confirmed and complemented by the work of entomologists in many countries. These experiments have provided extensive information on the insecticidal and acaricidal efficacy, pharmacological effects, and other properties of Systox. A recent literature survey by P. A. Giang of the United States Department of Ag-

*Presented at the joint meeting of the Entomological Society of Canada and the Entomological Society of Ontario at Sault Ste. Marie, Ontario, Canada, Nov. 1-3, 1954.

riculture (4) lists approximately one hundred and fifty references pertaining to Systox.

Technical Systox, the active ingredient in Systox spray concentrate, consists of two closely related isomers. Table I gives physical and pharmacological data. Systox is potentially a polytoxic pesticide, i.e., it is effective against many species if sufficiently high dosages are applied. Within an economically feasible dosage range, however, it exhibits marked specificity in its action against aphids and mites (18). It has been shown by many workers in various countries to give effective control of a great number of aphid and mite species. Its contact action provides quick initial knockdown. This is an important factor for instance in the control of virus vectors; furthermore, it makes Systox a valuable corrective pesticide against established populations which have to be knocked down quickly in order to save the crop. The systemic properties of Systox are responsible for its considerable residual effectiveness.

Systox does not contain any chemical groupings in the molecule that would lend themselves as a basis for a specific chemical method for residue analysis. However, a biological micro-analysis method could be developed by utilizing the in vitro cholinesterase inhibition properties of Systox. By this method, as well as by usage of radiotracer methods, a large number of samples of Systox-treated crops have been analyzed during the past three years in cooperative projects with many experiment stations in the United States. It has been shown that no harmful toxic residues are present in treated plants at harvest time, if applications are made according to recommendations. Dosages generally range from ¾ to 1½ pints of formulated spray concentrate (containing 23% active ingredient) per acre or per hundred gallons of spray, depending upon the crop and upon the insects or mites that are to be controlled. Systox is not to be applied within twenty-one days of harvest of edible portions of plants. Organoleptic tests involving many different crops have been conducted at numerous locations. No off-flavors have been reported, even at dosages considerably in excess of recommendations. Systox was the first systemic insecticide to be approved for use on food crops. In the United States, it is currently registered nationally for use on apples, potatoes, English walnuts, cotton and ornamentals. Additional usages and registrations are anticipated. In Europe and elsewhere, Systox is established as an important production factor, contributing substantial increases in quality and/or quantity of harvest products. Usage fields include control of aphids transmitting virus yellows disease of sugar beet, control of aphid vectors of various virus diseases of potatoes, control of aphids and mites on other field crops, on deciduous fruits, hops, ornacentals, in tree nurseries, and on a number of other crops. Certain species of foliar nematodes are also effectively controlled.

The effects of Systox on bees and wildlife have been investigated by various research workers. It was ascertained that Systox is harmless to bees unless they are hit directly by the spray. Various species of wildlife were unaffected when directly exposed to Systox spray in wire screen cages in the field, or by feeding on freshly treated plants.

A proper understanding of the fact that Systox, as well as systemic pesticides in general, represent a basically new approach to pest control in agriculture is imperative for their sensible usage. The fundamentals of pest control by systemic pesticides, the interrelations between the major elements involved, and their relative significance have been systematically investigated by G. Unterstenhöfer (14, 15, 16, 17, 19). The systemic life of a toxicant may be divided into four phases:

(1) The incorporation into the plant may take place by absorption by the plant, or by active penetration of the chemical.

(2) Inside the plant, the toxicant can be translocated either in the xylem or the phloem, or in both. Its stability inside the plant determines the duration of the induced temporary resistance of the plant.

(3) The third phase, the toxication of the pest, is obviously the most important, from the control point of view.

(4) Finally, the elimination of the toxicant by decomposition and/or excretion from the plant terminates its systemic life.

Reviewing all the information on Systox available to date, it appears

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TABLE 1

SYSTOX		thionoisomer	thiolisomer
Refr. Index	$n_D^{18°C}$	1.4900	1.5000
Spec. Grav.	$d_4^{21°C}$	1.119	1.132
Vapor Tens.		mmHg Bp,°C	mmHg Bp,°C
		0.15 81	0.15 93
		0.4 94	0.25 100
		0.6 100	0.4 110
		2.2 121	0.8 120
		3.3 130	1.0 128
Water Sol. approx.		1 : 15,000	1 : 500
Appr. acute LD			
rat, per os		75 mg/kg	2.5 mg/kg
mouse, subc.		15 mg/kg	10.0 mg/kg

TABLE 2

META-SYSTOX		thionoisomer	thiolisomer
Spec. Grav.	$d_4^{20°C}$	1.1904	1.1207
Vapor Tens.		mm Hg	mm Hg
	10°C	7.0×10^{-4}	1.5×10^{-4}
	20°C	18.5×10^{-4}	3.6×10^{-4}
	30°C	46.0×10^{-4}	10.5×10^{-4}
	40°C	110.0×10^{-4}	29.0×10^{-4}
Water Sol. approx.		1 : 3,000	1 : 300
Appr. acute LD rat, per os		200 mg/kg	35-40 mg/kg

National Program Introduced at ANHYDROUS AMMONIA CONFERENCE

Top Photo: New Officers of AAI—seated (L to R): Charles W. Bourg, PV-82, Inc., Lincoln, Neb., 2nd vice pres.; Mark C. Craft, Mid-West Fertilizer Co., Springfield, Ill., pres.; Tully W. Talbot, Chemco, Audubon, Iowa, 1st vice pres. Back row: Major Gen. Ralph A. Wooten, Mid-South Chemical Co., Memphis, Tenn., treasurer, and Allen R. Brown, Edward S. Nelson, Ltd., Clarksdale, Miss., secretary.

Bottom Photo: Speakers at Conference: (L to R): R. Coleman, NFA president; W. A. Albrecht, Univ. of Missouri; Senator A. J. Ellender, Sr., Houma, La.; and F. E. Bear, New Brunswick, N. J.

"THE basic problem confronting American agriculture at present is not so much how to adjust production to demand . . . but how to do it *without reducing net farm income*," agriculturalists were told at the fourth annual meeting of the Agricultural Ammonia Institute, December 6-8th at the Jung Hotel, New Orleans, La. The statement was made to more than 1000 dealers, manufacturers, and representatives of industry by Dr. Russell Coleman, president of the National Fertilizer Association in an address on "Fertilizer—An Answer to Our Crop Surplus Problem." (The complete text of Dr. Coleman's address appears on pages 45-46).

In a specific discussion of the fertilizer supply picture, E. W. Thomas, retiring president of the AAI, reported that "Ammonia used for direct application, according to USDA figures, reached a total of 333,000 tons of nitrogen for the fertilizer year ending June 30, 1954. This was an increase," he said, "over use in the year ending June 30, 1953, of 108,000 tons of nitrogen, or 44 per cent." Mr. Thomas also advised that "Because agricultural nitrogen is an economically sound purchase for the farmer, there seems but little question that consumption will increase rapidly, and that use will quickly catch up with an apparent present oversupply."

That there currently is a definite oversupply of anhydrous ammonia was emphasized in a general report to the conference by the association, which pointed out that "Productive capacity for anhydrous ammonia has not only kept pace with increased consumption; but the large number of new plants built in the last year and now under construction point to a dangerous over-supply of ammonia in the season ahead."

A program to expand the agricultural ammonia market and utilize the producers' increased capacity was prepared by Archer & Woodbury Agency and reported to the Association membership by Jesse Wooten and Ralph Wooten. The report pointed out that there is plenty of market potential to take up the present increased supply of anhydrous ammonia and much more . . . and that what is needed is a stepped-up sales, advertising and public information program to educate the farmer to use enough anhydrous ammonia for his own good and a stable industry. The program centers on a national advertising plan to be sponsored by the Agricultural Ammonia Institute, with an AAI committee to supervise it.

Following this report, the membership approved a resolution favoring a sales promotion program to be tied in with a distributor promotion plan, in which a committee of three directors of the AAI and three representatives of ammonia manufacturing

firms will prepare a program for submission to the agricultural ammonia industry through the AAI.

E. W. Thomas reminded association members and guests that "formulation of an effective distribution system should not be considered the burden of the distributor alone. Producers should recognize their responsibilities along this line. Policy at producer level can vitally affect the aggressiveness and effectiveness of the distribution system in that it can have a decided effect on the confidence and enthusiasm with which the distributor attacks his problems."

New Officers Elected

OTHER highlights of the three-day conference included reports on plant nutrition, a report from Washington, discussion of nitrogen fertilizer, and a review of engineering considerations in handling and using anhydrous ammonia. At the general business sessions, Mark C. Craft, Midwest Fertilizer Co., Springfield, Ill., was elected president to succeed E. W. Thomas, Farm Service Corp., Boonville, Mo. Tully Talbot, Chemco, Audubon, Ia., was elected first vice president; C. W. Bourg, PV-82, Inc., Lincoln, Neb., was elected second vice president; A. R. Brown, Edward S. Nelson, Ltd., Clarksdale, Miss., is the new secretary, and Gen. R. H. Wooten, Mid-South Chemical Co., Inc., Memphis, is treasurer.

Facts on Nitrogen

IN reporting "Some Facts About Nitrogen Fertilizers," Firman E. Bear, of New Brunswick, N.J., discussed the use, properties, application, and supply of nitrogen and advised that "Present indications are that our current population of 162 million will have grown to over 200 million by 1975 and to somewhere between 250 and 300 million by the year 2000. This will make it necessary," he said, "to expand our agricultural production both vertically and horizontally. In both cases more nitrogen will be needed." In reviewing comparative uses of the different forms of nitrogen, Dr. Bear advised that:

"Nitrate of soda is best adapted for use on the acid soils of humid regions. It is highly soluble and its nitrogen is immediately available to plants. It will dissolve in water absorbed by it from the air. It has an alkaline effect on the soil. Its sodium has great value as a solubilizing agent for soil phosphorus, as a partial substitute for potassium and as an element of value in its own right, notably for such crops as sugar beets and celery.

"Sulfate of ammonia is best adapted for use in irrigated arid and semiarid regions, in areas of neutral soils, and in overlimed acid soils of humid regions. The acid effect of each ton is estimated as the equivalent of 2200 pounds of pure limestone. And it should be kept in mind that each ton of sulfate of ammonia contains nearly 500 pounds of sulfur, an element that is needed by all plants and animals for nutritive purposes. If the time comes that the sulfuric acid that is used in the manufacture of superphosphate is replaced by nitric acid, we shall have need for this or some other carrier of sulfur in many areas that are some distance removed from industrial centers."

"In my opinion," Dr. Bear reported, "one of the most troublesome problems that lies ahead for the nitrogen industry is that of keeping the other nutrients in balance with the much larger amounts of nitrogen that will be applied." In further discussion of this statement, he said that if full advantage is to be taken of the tremendous potentialities in the use of large amounts of nitrogen fertilizers, special attention must be paid not only to maintaining adequate supplies of potassium in the soil but of all the other needed mineral nutrients, including the trace elements, as well."

Services in Plant Production

THE importance of soil management and its effects on fertilizer's role in plant nutrition was among the topics considered in a report by W. A. Albrecht, University of Missouri, Columbia, Mo. Dr. Albrecht advised that "while we manage soils to grow more crops, we must also grow better quality as nutrition into them. That quality depends mainly on more protein, not 'crude' but complete protein to give us all the required amino acids composing the proteins. Nitrogen helps make proteins but its use alone as a fertilizer is not tantamount to making those proteins complete nutrition." He reminded his listeners that plant nutrient elements and compounds adsorbed on, and exchangeable with the soil colloids . . . and not necessarily in aqueous solution . . are the fertility "available" to the plant roots He also indicated that increasing the degree of saturation of the soil's exchange capacity by fertilizer makes the same amount of rainfall more efficient in crop production. "Drought is often a shortage of fertility rather than of water."

Dr. Albrecht's report included charts, graphs, photos (all shown by lantern slide), illustrating the action of soil, effect of climatic conditions, action of trace elements, nutrition, etc.

Dr. Albrecht indicated that the production of proteins is the major soil management problem. Nitrogen must be administered very carefully, he cautioned. If it is, there is much in the better nutrition of microbes, plants, animals and man that it can accomplish.

Discussing "Contemporary Jitters . . . Their Cause & Cure," E. L. Lipscomb, National Cotton Council, Memphis, said that public sentiment and voting power are the only means by which Americans can curb high government expenditures and continued encroachment on private enterprise. He indicated further that worry over the question of what the unpredictable thing "called Washington" is going to decide for the people has given America a case of jitters and the American people won't get over it until individual action is taken to break the tightening grip of "big government." He urged individuals to do their part in stopping political exploitation by crystallizing public opinion in the area of their own personal influence.

A panel discussion on ammonia storage, application, etc., was led by

(*Continued on Page 121*)

A Visit to the *North Carolina Experiment Station*

THE North Carolina Experiment Station traces its origin to agricultural chemicals and probably its most valuable contributions to the state have been based on fertility studies.

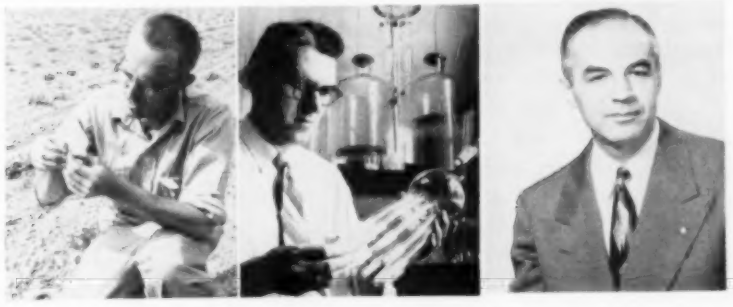
The Station—the nation's second oldest—was established in 1877, primarily to police the importation of fertilizers. Naturally low in productivity in the virgin condition, North Carolina soils respond beautifully to adequate fertilization. Today, North Carolina is the largest user of fertilizer among the 48 states, but commercial fertilizers haven't always enjoyed their current popularity among Tar Heels.

By 1877, the experience of a few farmers who had obtained materials of little use on their land cast suspicion on the young plant food industry. The 1877 Legislature took steps to assure that its farmers would enjoy the fruits of fertilization; it created the Board of Agriculture and the Experiment Station, empowering the agencies to inspect and control fertilizers coming into the state. In two years, fertilizers regained the confidence of North Carolina farmers, and the Experiment Station launched a positive research program.

Directed by Dr. Ralph W. Cummings, now on a special technical assistance mission to Peru, the institution comprises the central Experiment Station at N. C. State College, Raleigh, and 16 test farms located in the 12 farming areas of the state. In Dr. Cummings' absence, direction of the Station has been assigned to Dr. R. L. Lovvorn, director of instruction in the School of Agriculture.

The research plant serves a 53,000 square-mile area that extends 500 miles from the small citrus groves of hurricane-shaped Hatteras in the east; inland to the great tobacco and peanut plantations of the Coastal Plain; across the rolling grassland farms of the industrial Piedmont; and west into the tiny farms of the Great Smoky Mountains.

The job of originating and supervising the experiments to solve these problems belongs to the mother institution at N. C. State College. The State Department of Agriculture manages the test farms, and the U. S. Department of Agriculture contributes through special grants of personnel and financial assistance.



Left Photo: Dr. J. R. Dogger, entomologist, recently found that any one of three chemicals can do double duty in controlling Southern corn rootworm and thrips in peanuts.

Center Photo: Dr. T. G. Bowery is conducting a pesticide study in the chemistry department to find the possible effects of residues on control of pests, growth of plants, soil productivity and consumer health.

Right Photo: Dr. R. W. Cummings Director.

Research is conducted by scientists in 10 School of Agriculture departments — agricultural economics, agricultural engineering, agronomy, animal industry, biological sciences, chemistry, experimental statistics, horticulture, poultry science, and rural sociology.

Dr. Cummings, a native of Rockingham County in northwestern North Carolina, feels the Experiment Station's major task is presented by population growth and a scarcity of new productive land. The Station's research has four major purposes:

"To discover ways of increasing output per farm worker, per acre of land, and per animal unit; to improve efficiency of production; to improve the quality of farm products; and to improve efficiency in distribution of farm products in such a way as to make the biggest contribution to human welfare."

One of the more prominent achievements of the Experiment Station in serving its farmers has been the breeding of tobacco varieties with resistance to two diseases—black shank and Granville wilt. In a state which obtains 50 per cent of its cash farm income from tobacco, the development of disease-resistant tobaccos alone has been valuable enough to more than pay for the total operational cost of the Experiment Station throughout its 77-year history.

Soil Fertility Investigations

NOT so dramatic, but the foundation of agricultural productivity in a state with low-fertility soils, is the Experiment Station-State Department of Agriculture soil testing program. Working from the proposition that profitable use of lime and fertilizer depends on the level of fertility in the soil and the characteristics of the plant. Experiment Station agronomists have done remarkable work in establishing specific requirements for crops and finding the balance necessary between plant food elements. The Experiment Station uses summaries of soil tests in counties to point out the average fertility levels in given cropping systems.

The Station's standardized test is used by the Department of Agriculture in offering a free soil test and fertilizer recommendation service to any North Carolinian submitting a soil sample.

A research program in soil fertility must be based on a thorough understanding of the development and activity of plant roots in their soil environment, and the agronomy department's use of radio-active tracers is contributing a valuable fund of knowledge in this area.

Simply, the work consists of strategically locating a small amount of radio-active material at given distances from and below the plant and noting the uptake by the plant. Research with cotton, tobacco, corn and peanuts has been used to estimate the fertility pattern of the soil most likely to give maximum yields; plant spacing most compatible with root development; and the volume of soil from which the plant is extracting most of its water.

Another promising child of the atomic age is the mass spectrometer, used by agronomists to answer some basic questions about the use plants make of nitrogen—such questions as, "Shall we use nitrogen topdressing on grass-legume pastures"; "how much nitrogen does the plant get from the atmosphere and how much from applied materials"; "how does a plant use nitrogen when it's applied as a leaf spray"; and "what is the effect of leaf sprays on the nicotine content of tobacco?"

North Carolina is growing rapidly in the livestock business, overcoming a long economic dependence on one crop. Improved pastures, largely Ladino clover and grasses,. are the foundation that supports profitable livestock production in the state. But before these high quality, permanent pastures could be grown in North Carolina, farmers and the Experiment Station alike had to alter their thinking about fertilization rates.

In the 1890's the Station introduced Ladino to the United States from Italy. For one year, in plots located in Raleigh, the clover flourished, and then it failed and was forgotten by North Carolina for 40 years. In the late 1930's, the Station changed its fertilization recommendations; amounts previously considered so high as to be uneconomical became commonplace. Ladino clover came back to North Carolina. Under the new fertilization and management methods, it spread a green carpet across the state. In 1945, there were 500 acres of improved permanent pastures; now there are 1 million acres.

For the past 50 years, peanut production in North Carolina has remained at about 1,200 pounds per acre. Other crop yields have been greatly increased with fertilizers, but peanuts haven't responded. And peanuts rank third as a source of farm income in North Carolina.

Experiment Station agronomists recently found that only 10 per cent of the peanut flowers ever develop into fruit. Subsequent study revealed that flowering and fruiting are promoted by several minor elements, such as boron. Armed with this knowledge, the Experiment Station has been able, in tests, to reverse the original situation and obtain fruiting from 90 per cent of the flowers.

This and other recent research findings have at last equipped farmers to raise their yields. The Experiment Station has produced 5,000 pounds of nuts per acre in its plots.

The new station peanut varieties, N. C. 1 and N. C. 2, are contributing to increased production. Released last year, they yield 200 pounds more per acre and have a higher market value than farm stock—the peanut farmer's traditional source of seed.

"Nickels for Know-How", a program through which North Carolina farmers give 5 cents per ton of feed and fertilizer they buy to support 38 School of Agriculture projects, has backed Experiment Station research in several areas, principally cotton variety testing, crop stand failures, poultry nutrition, field and forage crop insect control, marketing, nematology, pesticides, poultry disease, and weed control.

An entomology project is aimed at wiping out an $11 million annual loss that field and forage crop insects

cause in the state. Here again, this work has extended the limits of peanut production by perfecting a control for Southern corn rootworm of peanuts and thrips. Treatments involving the use of either aldrin, heptachlor or dieldrin will control both pests. Prior to this discovery by Dr. J. R. Dogger, farmers went to the expense of treating separately to control the two. Without control, peanut yields are usually cut 30 per cent.

Dr. Dogger has also found a control for green June beetle grubs in pastures. Treating during the winter months on a field scale, Dogger found that parathion kills grubs within two days after application and is still effective 25 days later. Parathion at more than one pound an acre, or chlordane at more than five pounds, can satisfactorily reduce the grub population.

Part of Dr. Dogger's research is devoted to finding out the effects, if any, insecticides have on the taste of peanuts and on the flavor of succeeding tobacco crops.

An organic chemist, Dr. T. G. Bowery, is devoting full time to a study of the effect of pesticide residues on control of pests, growth of plants, soil productivity and consumer health. Dr. Bowery is seeking more information on the possible effects of pesticides on the plants themselves, as related to decreased yields, off-flavors and reduction in nutrient value.

A project conducted by Dr. R. P. Moore is directed to an investigation of the causes of inferior crop stands. His study includes any factor that weakens seed of any crop grown in North Carolina. Among other things, he has observed that seeds degenerate most rapidly at high moisture and temperature levels. Vigor, on the other hand, is maintained at high levels for long periods if the seed is properly dried and kept in cool, dry storage.

The breeding program of the Experiment Station has given North Carolina farmers such premium varieties as the Albritton and Massey Strawberries and Atlas wheat. Atlas has a higher protein content than earlier varieties and brings to the state's millers a good bread wheat.

Resistant to leaf rust and powdery mildew, Atlas created a market for a million new bushels of wheat a year, beginning with its release in 1951. High protein Atlas commands a premium; the protein depends on the application of unusual, but economical, amounts of nitrogen. The first year after Atlas was released, growers earned premiums that exceeded the year's $2½ million Experiment Station expenditures.

A weed control project, conducted by Dr. G. C. Klingman, recently revealed that solution nitrogen on corn has weed control as well as fertilization properties. The best results were obtained with applications of 2,4-D and a wetting agent in ammonium nitrate solution. Klingman also conducts weed control projects in small grains, horticultural crops, sorghums and tobacco.

Tobacco being a high-money crop, farmers will tolerate no damage to it from chemical weed control; there is no acceptable chemical weed killer available for the crop. Dr. Klingman believes the next four or five years will produce one.

Dr. R. P. Upchurch, who conducts a project in chemical weed control in cotton, soybeans, peanuts and forage crops, has tested a herbicide that looks promising in cotton. The material, Karmex DL, gave excellent control of grasses and some broadleaf weeds for six weeks without injuring the cotton.

A likely treatment in forage crops is offered by DNOSBP (salt) on legume-grass seedlings to remove annual weeds. With a little more research, Dr. Upchurch believes the Experiment Station can safely recommend the treatment.

One of the most common problems farmers find in vegetable plant beds is a condition known as "damping-off," caused by certain fungi. It is particularly serious on seedlings of such crops as lettuce, pepper, eggplant and tomato. Present methods of control consist of seed treatment plus the use of fungicidal drenches applied before and after seedling emergence.

This year the Experiment Station is recommending a new treatment, developed by Dr. D. E. Ellis, head of the plant pathology faculty. After three years testing, Dr. Ellis found that methyl bromide gas treatment of soil is highly effective in preventing damping-off. Tests at three locations showed that with the gas, good control of the condition was obtained, excellent plants were produced, and no serious injury was caused to plants.

The methyl bromide, used at the rate of two to three pounds per 100 square feet in the plant beds, also gave excellent weed control. While nematodes were not a problem in these tests, other tests have shown it effective against the parasite, even at this low rate.

A troublesome problem that has driven many western North Carolina vegetable growers from squash production has been scab of summer squash. Dr. Ellis has found that zineb or nabam sprays give good control of the disease. Farmers using the sprays report yields increased by 142 bushels an acre in many cases.

Cucurbit diseases have cut the yields of cantaloupe, fresh-market and pickling cucumbers, summer squash and watermelon by at least 35 per cent a year. The Experiment Station has devised controls that can eliminate most of this loss, namely, crop rotations, seed treatment, resistant varieties, and fungicidal sprays or dusts.

Dr. C. N. Clayton has had striking success in controlling fire blight of apples with antibiotics; Dr. C. J. Nusbaum's work on blue mold of tobacco plant beds, and Dr. W. E. Copper's work with new fungicides for treating damping-off and seedling failures in cotton are notable in the plant pathology field.

Experiment Station entomologists, directed by Dr. C. F. Smith, have given North Carolina fruit growers valuable aid in controlling the peach tree borer, plum curculios, and white peach scale. The Station entomologists have also discovered that insecticides in transplanting water give good control of wireworms

(*Continued on Page* 123)

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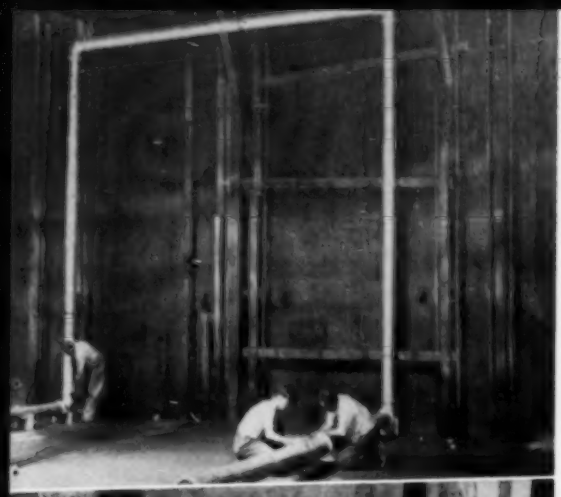


GRAIN FUMIGATION

by
G. L. Phillips
Stored-Grain Insects Laboratory*
Manhattan, Kansas

Top: Figure 1.—Placing aeration ducts in an empty hold. The floor ducts are perforated but the uprights and top connection are not. The blower is attached to the funnel-shaped portion at the right top.

Bottom: Figure 2.—Blower installed in escape hatch, in position to discharge air up the hatchway to the top decks.

SUCCESS in obtaining uniform distribution of methyl bromide by forced recirculation in steel storage tanks full of cottonseed (Phillips and Latta, 1949) or sorghum grain (Cotton and Walkden, 1951); in carloads of cottonseed (Phillips, 1952), shelled corn and sorghum grain (Phillips and Latta, 1953), or in bins of rice (Brook and Redlinger, 1954), has presaged the adoption of the same method in the fumigation of large bulk-grain storages. However, very few opportunities have been afforded to conduct research in this direction, because of lack of storages in which recirculation systems were present.

Recently, there has been great interest in mechanical aeration systems to provide cooling of the grain in fall and winter months to prevent moisture migration in bulk grain storages.

Such systems gave opportunity to provide recirculation systems by minor adaptations, and also to determine whether the air flow rates utilized in grain aeration would be sufficient for uniform distribution of fumigants. If this latter proved to be true, a combined aeration and recirculation system would be feasible, with the dual purpose of controlling moisture migration and fumigating the grain.

Forced recirculation of fumigants has been in use for many years in Europe (Monro, 1952), where grain is often stored for several years. Forced recirculation never gained prominence in North America, perhaps because until recently, grain was stored for short periods only, and fumigation, as currently practiced, gave very good insect control. However, with the tremendous quanities of grain now held in storge from year to year, extremely efficient insect control is needed to space fumigations at the longest possible intervals, and to lower costs.

The storage of Commodity Credit Corporation-owned wheat in holds of ships in the Maritime Administration Reserve Fleet beginning in 1953, where each hold was equipped with a mechanical aeration system, provided an excellent opportunity to adapt this system to the recirculation of fumigants. Three fumigation tests were made at the Hudson River, N. Y., Reserve Fleet, and one at the James River, Va., Reserve Fleet. These were followed by tests where a temporary recirculation system, using air flow rates comparable to those on the ships, was installed in a 135-foot grain elevator tank filled with shelled corn. The results of these experimental studies are presented in this article.

These tests were a cooperative study of the Stored-Product Insects Section, Agricultural Marketing Service, USDA, the Dow Chemical Co. and Michigan Chemical Corp. Arrangements to conduct experiments on the wheat stored in ships' holds were made through the Grain Division, Commodity Stabilization Service; those for tests in the grain elevator, were made with the Lauhoff Grain Co., Danville, Ill. Acknowledgements are due many persons in

Experiments in Utilizing Mechanical Grain Aeration Systems for the Forced Recirculation of Fumigants

* This laboratory is one of the field stations of the Agricultural Marketing Service, Marketing Research Division, Biological Sciences Branch, Stored-Product Insects Section, U.S. Department of Agriculture.

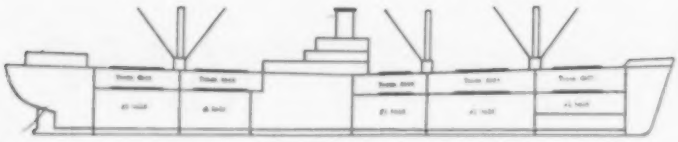


Figure 3.—Diagram of hull of a Liberty ship showing location of holds in which grain is stored.

those organizations assisting in the arrangements or in the experimental tests.

The tests were made to study the gas distribution pattern and did not include insect samples. The fumigation rates are not necessarily those adequate for efficient insect control, but were selected as the rates that would produce sufficient concentration to study the patterns under investigation. However, one hold contained heavy infestation of flour beetle, flat grain beetle, lesser grain borer, and a few rice weevils, in one part.

The Aeration System in Ships' Holds

EACH lower hold was equipped with two 10-inch perforated ducts laid down the length of the floor of the hold, about 8 feet on each side of the center. This placed one duct at about the center of each half of the floor area. Extension ducts led to an escape hatch leading to the top deck. The placement of the ducts in a typical hold is shown in Figure 1.

To utilize to the greatest extent the cooling effect of river water surrounding the hull, wheat was stored only in the lower holds. The tween deck hold was left empty and the hatchway between it and the lower hold left open. The grain was levelled off four feet below the deck.

An axial flow fan was attached to the end of the duct system, and discharged up an escape hatch that led to the top deck. The arrangement is shown in Figure 2. The fan delivered approximately 1,000 cfm under these conditions.

Technique.

The distribution of the fumigant was determined by analyzing gas samples from selected locations at periodic intervals. A thermal conductivity gas analyzer was used with the span adjuster set to read a concentration of one ounce of methyl bromide per 1,000 cubic feet for each unit on the galvanometer scale. The analyzer unit was operated by dry cell batteries because there was no source of power on the ships. The gas samples were drawn by a pump operated by an automobile battery fitted with a 110V A. C. converter.

The sampling probes were made of ⅛-inch galvanized iron pipe. Each probe was composed of an end section five feet long with one end pointed and with several 1/16-inch holes drilled near the point for the gas intake. Additional 5-foot sections with threaded ends were provided so that the probe could be lengthened to 10, 15, or 20 feet as desired. Plastic tubing connected to the probes led to the deck where the readings were made.

Procedure

Four tests were conducted in holds 1, 4, and 5 of ship A during March 1954, and in hold 5 of ship B during June 1954 (see Figure 3 for location of holds).

In hold #1, ship A, which held 23,500 bushels of wheat with an average depth of 10 feet, 10 probes were installed to draw gas samples from the 5- and 10-foot depths at the center and near the four corners of the hold. A sampling tube was also placed in the space above the load.

In hold #4, Ship A, which held 42,000 bushels with an average depth of 20 feet, 21 probes were installed. They were located at the 5, 10, 15, and 20-foot depths at the center and near the four corners of the hold, and at the 5-foot depth near the starboard wall. In addition, one sampling tube was placed at the top of the escape hatch; one at the fore center of the empty tween deck hold; and one on the starboard wall of the tween deck hold.

In hold #5, ship A, which held 41,000 bushels with an average depth of 20 feet, 21 probes were installed as in hold #4. In addition, one

(*Continued on Page* 117)

TABLE 1

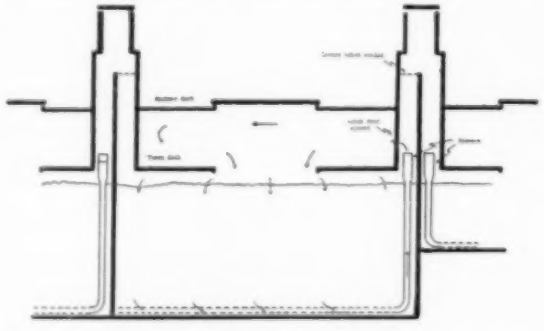
Hold number	Dosage	Capacity* (cubic feet)	Rate (lbs./1000 cu. ft.)
#1, ship A	50 lbs.	75,405	0.66
#4, ship A	150 lbs.	82,213	1.83
#5, ship A	50 lbs.	82,435	0.60
#5, ship B	150 lbs.	82,535	1.82

*Combined capacity of lower and tween deck holds.

TABLE 2

Hold number	Air flow per hold	Amount of grain	Flow rate (cfm/bushel)
#1, ship A	1000 cfm	23,500 bushels	.043
#4, ship A	1000 cfm	42,500 bushels	.024
#5, ship A	1000 cfm	41,100 bushels	.024
#5, ship B	1000 cfm	40,583 bushels	.025

Figure 4.—Diagram of lower and tween deck hold showing how recirculation is set up by sealing escape hatches and diverting blower discharge into tween deck hold.



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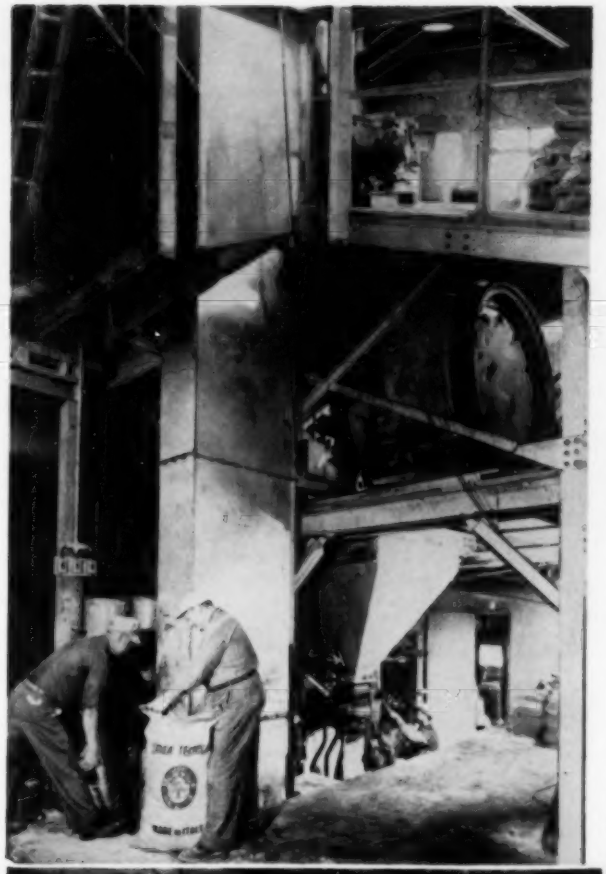

Automatic Equipment Installation Increases Fertilizer Production

THE Doggett-Pfeil Co., producers of specialty insecticides, fertilizers and garden chemicals, has just completed a re-equipping program in their fertilizer mill at Springfield, N. J., which has more than quadrupled their production rate and substantially reduced unit production cost.

A majority of the savings they have effected has been the result of reducing labor requirements through the use of more modern automatic-type machinery, according to the firm's President, Mr. A. S. Pfeil.

One of the greatest labor savers, they report, is the newly installed weigh-filling scale which has enabled Doggett-Pfeil to increase their sacking rate and at the same time maintain a very high degree of accuracy. The scale is an "over and under" indication type manufactured by the Exact Weight Scale Company of Columbus, Ohio. Design of the sacking scale combines it with a manually-controlled feed valve which is attached to the hopper.

Previous to installing the new equipment, Doggett-Pfeil's Springfield mill was producing about 5 tons per day of their custom-packed fertilizer. After replacing their old 500-lb. mixer with a new 1-ton capacity model, and installing a new hopper and grinder, all manufactured by the Sturtevant Mill Company of Boston, Mass., their production jumped to thirty tons per day.

With the installation of the new Exact Weight sacking scale, bagging rate has risen from about one per minute to six per minute, with accuracy held to plus or minus two ounces on the 100-lb. bags.

Top photo shows enclosed conveyor (left) which carries fertilizer components up to Sturtevant grinder (top right). Components then flow by gravity down chute to Sturtevant one-ton mixer (center, right) then down to hopper and Exact Weight sacking scale (bottom right). Machinery layout was carefully designed to use minimum of space.

In the bottom photo, two men handle the sacking work at greater than ever accuracy and far higher production rate with a new Exact Weight sacking scale. Over-and-under indicator which shows 25 lbs. under and 5 lbs. over enables feeding-gate operator to fill sacks more quickly, and not to lose time in trimming off-weight bags. Scale is set to fill bags to 100 lbs. 2 oz.—with a tolerance of plus or minus two ounces from that figure, resulting in range from 100 lbs. up to 100 lbs. 4 oz.

LISTENING *Post*

Effectiveness of Soil Fungicides in Potato Scab Control

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of AGRICULTURAL CHEMICALS. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Epidemics and Identification Section, Horticultural Crops Research Branch, U. S. Department of Agriculture, Beltsville, Md.

By Paul R. Miller

G. V. C. HOUGHLAND and Lillian C. Cash, of the Agricultural Research Service, United States Department of Agriculture, state that the use of soil fungicides for the control of potato scab (*Streptomyces scabies*) has certain limitations because a number of the fungicides that are likely to be effective against the causal organism frequently have been found to be toxic to potato plants, especially when used in the amounts that would be required for control. Application before planting sometimes offsets toxicity, but if this procedure appreciably delays planting, many growers may object. The cost of some fungicides in relation to their rate of application and period of effectiveness is another factor. Other considerations, such as ease of application, and toxicity to human beings while the material is being applied and later through absorption by the potatoes, emphasize the complexity of the problem of scab control through use of soil fungicides.

1953 Experiment: A field at Beltsville, Maryland, thoroughly inoculated with *Streptomyces scabies*, was laid out in 1953 as a randomized-block experiment with 4-row plots, 47 feet long, replicated three times. The soil fungicides were applied broadcast to the entire plot area, but only the two center rows were harvested for plot records. Water emulsions of P-162 (hexachlorocyclopentadiene) (P-162 was supplied by the Shell Chemical Corp., Denver) were applied with a small motor-driven sprayer equipped with a T-jet nozzle for hand application. Paraformaldehyde in flake form was applied broadcast by hand and sulfur was put on in finely ground form as "flowers". A gas mask was required while applying P-162 and paraformaldehyde. The land was disked twice immediately after the materials were applied. A cloud of P-162 vapor could be seen rising from these plots before disking could be completed, indicating that apparently there was some loss of this material through volatilization. The Katahdin variety of potato was planted with a 1-row planter adjusted to apply 1,800 pounds of 5-10-5 fertilizer per acre in bands. The soil reaction at planting time was pH 5.0.

The results of this experiment are presented in Table 1. In general, the soil fungicides had no highly significant effects on yields except that yield on plots treated with 140 pounds of P-162 ten days before planting was low. This result is difficult to explain in view of the favorable yield obtained with 80 pounds of the same material. The time at which the paraformaldehyde and P-162 treatments were applied had no pronounced effect on the yield or percentage of marketable potatoes as compared with the controls. Sulfur at both rates of application produced fewer scabby and more marketable potatoes than any of the other treatments. P-162 might have produced more beneficial effects if it had been applied so that the vapor could have been absorbed by the soil.

1954 Experiment: The field used in 1953 was reinoculated with *Streptomyces scabies* and used for the 1954 tests. The soil fungicides being tested were applied in the row mark at planting time, and all treatment plots were separated by untreated rows.

TABLE 1

Effects of three soil fungicides tested in 1953 for control of potato scab, Beltsville, Maryland

Soil treatment	Amount of fungicide applied per acre	Total yield tubers per acre	Marketable tubers per acre	Soil pH at harvest time
	Lb.	*Bu.*	*Pct.*	
Sulfur, 10 days before planting	400	313.0	63.1	5.4
Sulfur, 10 days before planting	800	281.4	73.9	5.5
P-162, at planting	40a	282.6	61.8	6.0
P-162, 10 days before planting	40a	259.5	54.4	5.4
P-162, 10 days before planting	80a	307.6	45.3	6.0
Paraformaldehyde, at planting	250	297.5	41.5	5.7
Paraformaldehyde 10 days before planting	250	318.4	29.7	6.1
None (check)	—	301.8	44.0	5.8
L.S.D. (0.5% level)		35.0	not sig.	

[a]Active ingredient.

A new spray method was used to apply the water-soluble sodium orthophenylphenate (OPP). The spray solution of this material was delivered from a T-jet nozzle (No. 730616), which applied approximately 188 gallons per acre in a band 18 to 20 inches wide ahead of the planter and centered on the row mark. The nozzle was located at the front end of the tractor pulling the planter, and spray was supplied at 100 pounds pressure from a reservoir and gear pump operated by the tractor power-takeoff. Thus the spray was applied to the soil that the planter placed around the seed piece and in the ridge—an ideal method of application. The sodium orthophenylphenate was dissolved at sufficient concentrations to give 50- and 100-pound applications under the conditions specified.

It was originally planned to apply pentachloronitrobenzene (PCNB) (supplied by Mathieson Chemical Corp., Baltimore) as a spray. However, the material available was 75% wettable powder, which the gear pump would not apply without damage to the gears. Therefore, it was mixed with sand and applied by hand in the row mark and then mixed with the surface soil. Katahdin potatoes were planted, and 1,800 pounds of 5-10-5 fertilizer were applied in bands.

The results of this test are given in Table 2. It is apparent that PCNB, up to 200 pounds of active ingredient per acre, was effective in reducing scab. However, the 200-pound rate produced a highly significant reduction in total yield (66.5 bushels) as compared with that on the untreated

(*Continued on Page 121*)

Review of 1954 Distribution Records Shows Spread of Insect Pests

This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is head—Economic Insect Survey Section, Plant Pest Control Branch, U. S. Department of Agriculture, Washington. His observations are based on latest reports from collaborators in the U.S.D.A.'s pest surveys throughout the United States.

By Kelvin Dorward

ALTHOUGH outstanding progress has been made during the past year in the control of insects, it must be pointed out repeatedly that the fight is never ending. In order to point up just one phase of this continual fight it is believed that a review of some of the more important new insect distribution and damage records reported during 1954 might be interesting.

Three of the most important new insect distribution records of the year involved the finding of gypsy moth, white-fringed beetle and European chafer at points remote from established infested areas. During May gypsy moth was discovered at Lansing, Michigan. This infestation involved about 10,000 acres. An eradication program was begun immediately and over 85,000 acres were sprayed. During subsequent surveys on approximately 1,600,000 acres, only one egg mass was found within the sprayed area and three very localized infestations outside the area. New Jersey also reported a gypsy moth egg mass find. On November 22 a single egg mass was taken in the northernmost tip of the State and within one-half mile of Port Jervis, New York. Although one male moth was trapped at Englewood Cliffs in 1953, no gypsy moth infestation had been found in New Jersey State since 1935.

New Jersey also reported the finding of the white-fringed beetle in early December. A heavy infestation in sweetpotatoes was discovered at Vineland, in northern Cumberland County. Specimens from this infestation were identified as *Graphognathus leucoloma* race *imitator*. Prior to the New Jersey record, white-fringed beetle had not been found north of eastern North Carolina. White-fringed beetles also continued to spread in known infested States. Of particular importance were the finds in the delta area of Mississippi, and in Hardeman County, Tennessee.

Adult European chafers were trapped June 24 near Capon Bridge, West Virginia. This represented the first find of this serious pest of turf outside of the State of New York, and the Meriden, Conn. area. Outside the original known infested areas near Newark, N. Y., the chafer was

TABLE 2

Effects of two soil fungicides tested in 1954 for control of potato scab.

Soil treatment: lb. per acre	Marketable tubers per acre		Average difference from check of marketable tubers[a]	Scabby tubers per acre		Total yield per acre	Average yield per acre difference from check[a]	Soil reaction at planting time	Soil reaction at harvest time
	Bu.	*Pct.*	*Bu.*	*Bu.*	*Pct.*	*Bu.*	*Bu.*	*pH*	*pH*
PCNB, 100	275.3	70.2	+193.0[c]	117.1	29.8	392.4	+10.4[d]	6.4	4.9
PCNB, 150	272.2	73.4	+189.9[c]	98.8	26.6	371.0	—10.9[d]	5.9	5.5
PCNB, 200	252.9	80.2	+170.6[c]	62.5	19.8	315.4	—66.5[c]	6.1	5.9
OPP, 50	141.6	35.1	+59.2[c]	261.3	64.9	402.9	+20.9[d]	5.9	5.3
OPP, 100	130.9	33.8	+48.6[b]	256.9	66.2	387.8	+5.8[d]	6.3	5.4
None (check)	82.3	21.5	—	299.7	78.5	382.0	—	6.2	6.0

[a]6 paired comparisons. [b]Significant. [c]Highly significant. [d]Not significant.

taken for the first time in 1954 in the Buffalo, Elmira, Liverpool, Niagara Falls and Syracuse areas.

In every case involving these new insect finds, suppressive or eradicative measures were undertaken immediately.

Among the cereal and forage pests, several new important records were reported in 1954. Sweetclover weevil was reported from Oregon and Utah for the first time. Subsequent surveys in Utah showed this pest to be rather widely established in the State. The weevil was also found in several new areas in the State of Washington. The alfalfa weevil, a relatively new pest in the East, was taken for the first time in West Virginia during May, with light infestations being found near Charles Town. The insect continued to spread in several states, particularly New Jersey and Virginia.

Although not necessarily new in distribution, but in being responsible this season for economic damage to alfalfa in the United States, is the yellow clover aphid *(Myzocallis trifolii)* which caused heavy losses in Arizona, California, Nevada and New Mexico. This species has been known to attack clover for several years, but this is the first year it has been recorded as a pest of alfalfa. New ground pearl records were reported from North Carolina and California. *Eumargarodes laingi* was collected in the former State and *Margarodes meridionalis* in the latter. These insects attract attention in some areas as pests of grasses, especially in lawns. The southwestern corn borer extended its known range this year eastward in Arkansas as far as Van Buren and Faulkner Counties. In Missouri the extension was north across the Missouri river into Platte County and east to Dallas County.

The outstanding new fruit insect record of 1954 was the finding of Mexican fruit fly in California. Heretofore it was found in the United States only in the Rio Grande Valley of Texas. A single specimen was taken in a grapefruit tree in San Ysidro, San Diego County, August 9. The California discovery was not necessarily unexpected, since Mexican fruit flies had been found just over the border in Baja California, Mexico, for a period of several months prior to the California find. An intensive eradication program is under way on both sides of the border.

The walnut husk fly was found for the first time in Yakima, Washington, in October and in Sonoma County, northern California near the end of the year. Although the walnut husk fly has been an important pest in southern California for some time, this new find is especially important to Persian walnut growers in the northern section, inasmuch as the industry has been moving from the southern part of the State.

A small infestation of Mexican bean beetle found at Twin Falls, Idaho, in August highlighted the new records for truck crop insects. As far as known this was the first occurrence of this major pest of beans in that State. Eradicative measures were carried out and subsequent surveys in the area failed to reveal any infestation.

The tomato russet mite, which has attracted considerable attention in some of the Eastern States in the past two or three years, was found for the first time in local areas of Virginia and North Carolina during 1954. Although the asparagus beetle occurs widely over the United States, it had not been recorded in Arizona until the past April when small numbers were found on asparagus at Yuma.

The spread of pink bollworm of cotton continued in some of the infested States, particularly Oklahoma, Louisiana and Arkansas. Although the pink bollworm quarantine had included the entire State of Oklahoma, finds this year extended the infestation to Osage County which approaches the northern boundary of the cotton belt. In Louisiana all newly-infested counties were within the quarantined area, but in Arkansas finds were recorded outside the quarantined area both to the east and north, with specimens having been found in Clark, Logan and Yell Counties.

The cotton stem moth, a potential pest of cotton known previously in this country only in eastern New York and local areas of Massachusetts and Connecticut, was taken in several coastal areas of New Jersey during the summer.

Another insect previously recorded in the area concerned but which caused economic loss for the first time in 1954 was the brown cotton leafworm. This insect was responsible for considerable damage to cotton in the south central, eastern and upper coastal areas of Texas. Specimens of the pest were taken late in the season in western Louisiana.

There were several new records for pests affecting forest, shade trees and ornamentals. The European pine shoot moth was collected for the first time in Maryland, while a long-horned weevil *(Calomycterus setarius)* was reported for the first time in Vermont. Another weevil *(Mecinus pyraster)* was found in Maryland during September. This is a new record for the United States. Neither of these weevils is apparently of any great economic importance. European earwig, which occurs rather widely over the eastern and western States, was reported for the first time in Delaware and Maine. A new record for the Country was established in Massachusetts during August when a linden mite *(Eotetranychus tiliarum)* was collected on linden at Amherst. The potential of this pest is unknown. Two scale insects, new to Florida, were reported from that State during the year. *Vinsonia stellifera* was taken on orchids in Miami and *Aspidiotus taxodii* was found on bald cypress at Palmdale.

Largely in connection with survey for the khapra beetle, a pest of stored products which was found in the Western Hemisphere for the first time in 1953, having been reported from California, several new records were established. The beetle, itself, was reported for the first time in 1954 from Arizona and New Mexico and several additional counties in California. Two minor beetle pests

(Continued on Page 117)

WASHINGTON *Report*

by
Donald G. Lerch
Cornwell, Inc., Washington, D. C.
(Agricultural Chemicals Washington Correspondent)

NEW answer to the continuing problems presented by the growing use of fertilizer—pesticide mixtures may be a special hopper on the corn planter. The hopper would be designed exclusively for the pesticide mixture. This would serve to keep the two materials separate until they meet in the soil. It would also keep the two industries separate and head off a host of problems.

Right now some companies are finding sizable markets for fertilizers with the pesticide material already combined. An estimated 70% of the fertilizer-pesticide mixtures are being applied to corn. But, other companies say they won't touch it.

Whatever businessmen say, however, it's the farmer who is the big factor in finding the answer. Some of the results in the cornbelt from the application of pesticides to control soil insects are almost amazing. Tremendous increases in yields have resulted on farm after farm. Research at experimental stations is building a backlog of evidence which will probably encourage more farmers to buy chemicals to control soil insects.

Most of the people I've talked to say—this is a growing field. What's more, the wonderful thing about it is, it helps the pesticide industry get away from the "cyclic" nature of the business which sometimes panics the bankers who finance the industry.

It's hoped that there'll be more evidence to support the application of pesticides to control soil insects every year for at least part of the farm. This would mean more regular business—a steady income. It would give advertising and promotion people a more stable market "to sell."

Time after time I've seen companies gear up tremendous advertising programs which later went in the trash can because the bugs didn't cooperate or because there was no clear-cut agreement on how many bugs you should find on a given twig before you should spray.

At the same time, the farmer's reaction to pressure to cut the cost of production, forces him to try to apply both fertilizer and pesticide simultaneously. The farmer is just as human as the rest of us in wanting a "one-shot" package and application. The point is that at present there's strong feeling that the "one-shot deal" sounds better than it is.

For instance, new research is about to get under way on the thoroughness with which a sack full of pesticide can be mixed in a ton of fertilizer. This is just one of the problems involved. Until science comes up with more answers, some industry men think the hopper is the best answer for the farmer and for the industry.

* * * * * *

"I am heartened by the continued atmosphere of cooperation evidenced by members of the pesticide industry with respect to the residue tolerance and operation of the "Miller Bill" which is now law," George P. Larrick, Food and Drug Commissioner, said. "There are some problems of course, but we feel certain they can be solved. I look forward to a continuation of this attitude on the part of all concerned."

Commissioner Larrick's views are shared by industry leaders and officials in other Government agencies. Thus, as the New Year begins, it appears the residue problem is being met in such a manner that industry and farm progress will be speeded.

* * * * * *

"Our objective is complete elimination of the Khapra beetle in infested plants," says Dr. W. L. Popham, Chief of Plant Pest Control Branch, USDA. "We are bringing research to bear directly on this problem and we are hopeful of success. If a Federal quarantine is invoked it would be possible to achieve the goal of clean-up with the least possible interference with normal treatment practices."

Dr. Popham emphasizes that control measures will be carried out in cooperation with the treatment at every possible opportunity. The public hearing late last year by the Department collected evidence showing the menace to be quite sizable and building a potential threat over large areas.

Already, several states have individual quarantines. Some states are taking action against others. The situation is still fluid.

At the beginning of this year the following counties harbored infestations:

7	California
5	Arizona
2	New Mexico

The Khapra beetle is a stored-grain pest, native to the Far East, including India, Malaya, and Ceylon. It was first identified in California about a year ago. Sixty to seventy-five establishments have been infested at latest count. The beetle infests all kinds of cereals and cereal products, also legumes, peanuts, cottonseed, and rice. The USDA feels that fumigation will be the main weapon in the campaign for eradication.

(*Continued on Page* 117)

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4. Today recommended practice on rough country is aerial seeding of subterranean clover and aerial topdressing with 224 lb. limestone and 180 lb. molybdenized superphosphate an acre. Total cost is about $6 an acre.
5. On many properties this aerial treatment has raised carrying capacity from one-half sheep an acre to 2-3 sheep in only two years. The increase in cash income is over $20 an acre each year.

MA 4-13

CLIMAX MOLYBDENUM

Inventory of Fertilizer Developments

Reprinted From Chemical Engineering, Inventory Issue 1954

• PRODUCT	• PROCESS	• USER & LOCATION	• FEATURES	• STATUS & REMARKS
Ammonia synthesis gas	Coal partial combustion	Du Pont Co., Polychemicals Dept. Belle, W. Va.	Powdered coal burned in fluidized bed in atmosphere of steam and deficient oxygen in furnace similar to conventional slag-tap boiler furnace. Produces CO and hydrogen.	Process being tried out on large scale to make synthesis gas for ammonia, eliminate coke ovens and gas producers. Developed jointly by Du Pont, Babcock & Wilcox, and Bureau of Mines.
Ammonia synthesis gas	High-pressure reforming	Shell Chemical Co. Ventura, Calif.	Natural gas reforming reaction for synthesis gas operates at available gas pressure, thus saving 25-35% of power for subsequent compression of synthesis gas.	About 70% of gas feed converted to raw synthesis gas in reforming furnace, remainder in combustion furnace. Developed by M. W. Kellogg Co.
Ammonia synthesis gas	Partial oxidation of methane	Spencer Chemical Co. Vicksburg, Mass.	210 ton/day plant using 95% oxygen for partial oxidation of natural gas to hydrogen and CO_2. Latter is removed. 1,000 ton/day air separation plant supplies oxygen and nitrogen. Texaco process.	Started up January 1954. Liquid nitrogen from separation plant is used for scrubbing hydrogen, and in synthesis gas. Similar plants under construction elsewhere. Built by Foster Wheeler.
Ammonium nitrate	Continuous (Stengel)	Commercial Solvents Corp. Sterlington, La.	Ammonia and nitric acid react directly at 400 F. to yield molten nitrate, which is cooled on Sandvik steel belts, and then crushed. Eliminates evaporation and graining or prilling.	200 ton/day plant in operation.
Ammonium nitrate	Two-stage crystallization	Aburdarverksmidjan H. F. Reykjavik, Iceland	Ammonia and nitric acid react with liberation of enough heat to evaporate all water. Evaporation is divided between two stages.	Plant in operation, 70 ton/day.
Fertilizer	Waste conversion	Chicago Stockyards Composting Co. Chicago, Ill.	Stockyard waste is aerated at 160 F. until dustfree and odorless. Product is 2-2-2 fertilizer.	$250,000 plant in operation, capacity 3,500 tons/yr. Other similar operations on waste and garbage being considered in various cities.
Fertilizer, ammonium-phosphate-sulfate	Acidulation-ammoniation	Stauffer Chemical Co. Tacoma, Wash.	Pelleted product is 8-12-0 at present, containing 5-10% N, 10-15% phosphoric acid (90% water soluble).	Developed by Rumianca. Stauffer's 25,000 ton/yr. plant on stream Jan. 1954.
Fertilizer, mixed	Automatic	Naco Fertilizer Co. Ft. Pierce, Fla.	Complex, varied formulas batched by automatic scales, mixing equipment and conveyors.	Plant in operation.
Fertilizer, mixed	Granulation	Eastern States Farmers' Exchange Wilmington, Del.	Rotary dryer modified to serve also as granulator by removing flights from feed end. Pug mill serves as feeder. Product is uniform size, homogeneous.	Plant capacity, 15 tons/hr., in operation.
Fertilizer, nitrophosphate	Calcium nitrate conversion	Gewerkschaft Victor Castrop-Rauxel, Germany	Addition of small quantities of metallic salts such as Mg or Al permits high pH of ammoniated nitric-acidulated phosphate. This alkaline slurry can be treated with CO_2 to convert hygroscopic calcium nitrate to calcium carbonate.	Process developed in France by Potasse et Engrais Chemique. Offered in U. S. as successful solution to nitric acidulation problem by Chemical & Industrial Corp., Cincinnati.
Fertilizer, nitrophosphate	High-strength nitric acidulation	Lonza Electric & Chemical Works Basle, Switzerland	Phosphate is acidulated with 68-75% nitric acid instead of usual 50%; no drying is required. Granulated product is powdered with hydrated lime and can be stored without caking.	Avoids need for ammoniation to overcome hygroscopicity of calcium nitrate.
Fertilizer, nitrophosphate	TVA	Illinois Farm Supply Co. Tuscola, Ill.	$1,250,000 plant will use acid and ammonia from National Petrochemical.	Operation expected Jan. 1955; capacity to be 50,000 tons/yr.
Fertilizers, various	CO_2 blasting		Heaving action of expanding CO_2 released from a steel tube breaks up solidified storage piles. Safer than using dynamite.	Developed by Cardox Corp., Chicago.
Superhosphate	Ammoniation	Tennessee Valley Authority Wilson Dam, Ala.	Continuous ammoniator for superphosphate employs a rotating cylinder, with buried ammonia jets.	Pilot plant in operation.

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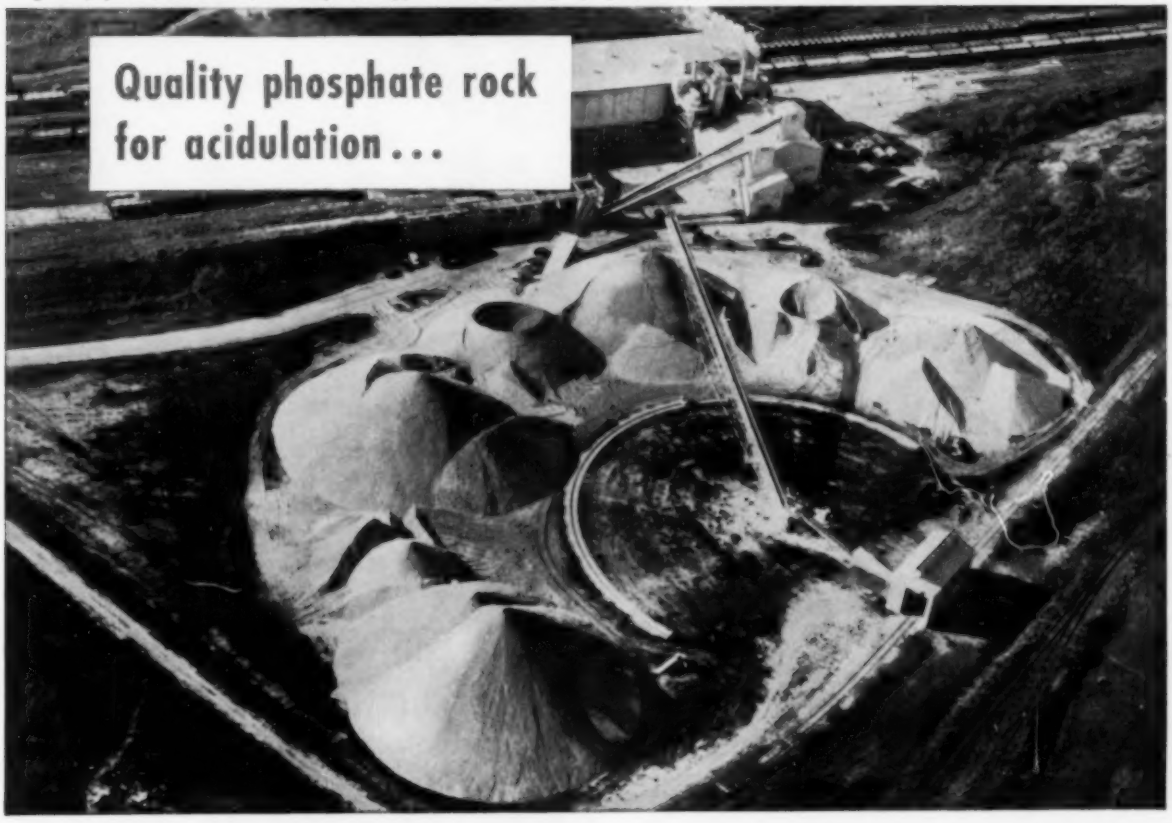

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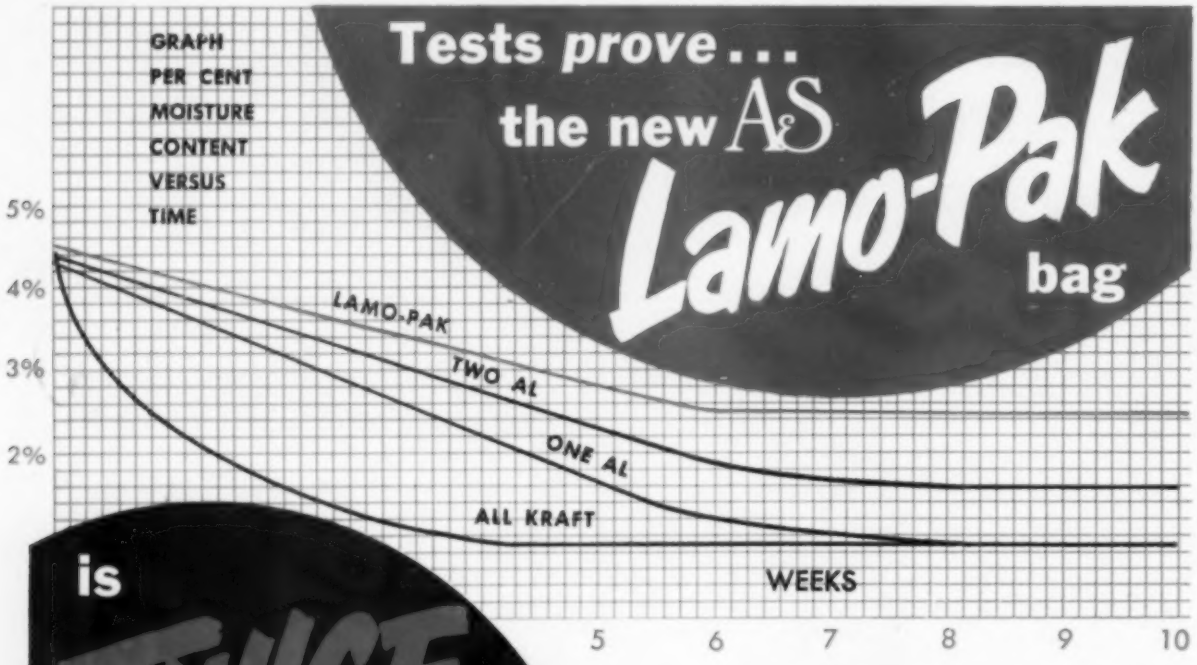

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Technical
SECTION

Diammonium Phosphate Production

THE production of essentially pure diammonium phosphate fertilizer from electric furnace phosphoric acid and ammonia has been carried out experimentally by the Tennessee Valley Authority. The product $(NH_4)_2HPO_4$ contains only small percentages of monammonium phosphate.

Both mono- and diammonium phosphate are particularly well suited for use on alkaline soils and can also be useful on acid soils when the residual acidity is neutralized with limestone or dolomite, according to recent agronomic reports. Based on unpublished data of TVA, the P_2O_5 in diammonium phosphate has greater mobility in the soil than that in concentrated superphosphate, calcium metaphosphate, or a commercial mixed fertilizer.

Diammonium phosphate is considered to be an important material for use in mixed fertilizers because of it high concentration of water-soluble plant food, and its favorable physical properties. A series of mixtures were prepared in the laboratory from diammonium phosphate made from electric furnace acid and common fertilizer materials to give N-P_2O_5-K_2O grades of 28-28-0, 18-18-18 and 5-20-20. Diammonium phosphate proved to be fully compatible with potassium chloride, ammonium nitrate, and concentrated superphosphate. A small loss of availability was noted when normal superphosphate was substituted for concentrated superphosphate. The mixtures containing normal superphosphate became caked during aging. Diammonium phosphate has been reported to be incompatible with limestone or dolomite in the presence of heat and moisture, evolving free ammonia.

The new process developed by TVA consists of feeding phosphoric acid and ammonia at a NH_3:H_3PO_4 mole ratio of substantially 2.0 into a saturated solution of ammonium phosphate having a NH_3:H_3PO_4 mole ratio of around 1.6 contained in a vacuum crystallizer. Diammonium phosphate crystallizes out of solution and is recovered by centrifuging. The crystals from the centrifuge are then dried. Atmospheric evaporation, such as used commercially in making monoammonium phosphate fertilizer, is not satisfactory for making diammonium phosphate. The ratio of ammonia to water vapor over saturated solutions of diammonium phosphate is so high, at temperatures approaching that of the atmospheric boiling point, that recovery of ammonia from the vapors would be an economic necessity. If, however, evaporation is carried out at lower temperatures, as under vacuum, the ratio of ammonia to water in the vapors is low and ammonia losses from the Crystallizer can be kept low enough to be ignored. A flow diagram of the process is shown.

Multiwall kraft bags are satisfactory for storage of the granulated material. Moisture-resistant plies in the bags are unnecessary.

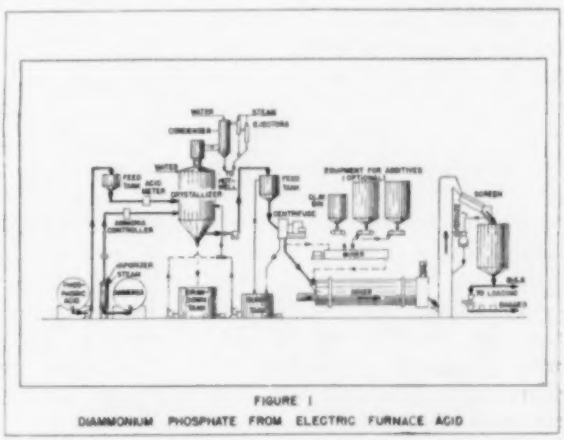

FIGURE 1
DIAMMONIUM PHOSPHATE FROM ELECTRIC FURNACE ACID

Flow diagram of process for production of diammonium phosphate.

Reported in National Fertilizer Review, December, 1954.

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Report on Strobane

A new mothproofing development employing Strobane insecticide has been announced by B. F. Goodrich Chemical Co., Cleveland, O.

In a report presented before the 41st annual meeting of the Chemical Specialties Manufacturers Association in New York, J. S. Wolff of Goodrich said that Strobane is highly effective against both clothes moths and carpet beetles. The two pests cause over $300,000,000 worth of damage annually, according to U. S. Department of Agriculture estimates.

Mr. Wolff outlined the extensive testing program conducted by B. F. Goodrich Chemical Company to determine the most effective spray formulations and methods of delivery.

Strobane was introduced as a new basic insecticide approximately a year and a half ago and is widely used in household liquid and aerosol sprays. The material has the advantage of low chronic toxicity to warm-blooded animals with repeated or extended exposure. Strobane also shows promise in combatting insects infesting livestock, fruits, vegetables, forage, and field crops.

DDT Increases Potato Yields

Experiments covering a period of four growing seasons indicate that fewer applications of DDT with correct timing produce equal yields of potatoes at less cost, according to the latest bulletin (# 533) published by the Maine Agricultural Experiment Station in Orono. The bulletin prepared by Dr. Geddes W. Simpson, head of the Department of Entomology and Wayland A. Shands, entomologist of the Agricultural Research Service of the United States Department of Agriculture indicates that all of the DDT treatments increased potato yields and gave satisfactory control of aphids. Both DDT sprays and DDT dusts were used in the experiments. In either dusted or sprayed plots the experiments indicate that little is gained by continuing weekly applications of DDT beyond early August unless there is the possibility of reinfestation of the fields by winged aphids.

Both DDT sprays and DDT dusts gave good control of buckthorn, green peach and foxglove aphids, according to the authors of the bulletin.

Where comparisons were possible the yields of potatoes were usually slightly larger from the dusted plots than from the sprayed plots, but the two treatments produced little difference in the number of potatoes falling into the U. S. No. 1 Grade.

When late blight occurred, according to Simpson and Shands, sprays seemed to give better control of the disease than dust formulas.

•

Control of Truck Crop Pests

Effective ways of controlling truck crop insects, the seed-corn maggot as a bean pest, and the onion thrips—are recommended to growers in two new U.S.D.A. bulletins.

John C. Elmore, author of Leaflet 370, recommends that bean seed be treated prior to planting with aldrin, dieldrin, or lindane to protect germinating seedlings from damage by the soil-infesting seed-corn maggot. The insecticide can be mixed with a fungicide and applied as a slurry to the bean seeds as a single treatment. By using dosages recommended, less than an ounce per acre is needed.

Leaflet 372 reports on extensive tests by entomologists J. Wilcox and F. H. Shirck that show dusting or spraying of growing onions with DDT, dieldrin, heptachlor, toxaphene, malathion, or parathion will prevent damage by thrips. Of these insecticides only malathion is recommended for use on onion foliage that is to be eaten. Malathion should not be applied to such foliage within 5 days of harvest.

•

Antibiotics for Halo Blight

Streptomycin was found to be very effective for curing halo blight of beans, according to a recent report by USDA scientists. They report that antibiotics may find an immediate use in the field of seed treatment for the elimination of seed-carried bacterial diseases. Although seeds are readily surface-sterilized, it is hard to eliminate microbes within the seeds, such as the black-rot bacteria carried in the seeds of the cabbage family. Aureomycin has been used successfully as a seed treatment for the control of cabbage black rot. Seed germination was not affected.

Although the use of antibiotics on edible products is at present prohibited by the Pure Food Laws, the experiments involving the treatment of spinach with solutions of streptomycin may serve to modify some thinking in the future.

Chemotherapy has been used successfully, on an experimental basis, to control a number of vegetable diseases. The Connecticut Agricultural Experiment Station has developed a test method which measures the ability of compounds to make tomatoes resistant to Fusarium wilt. The plants are first fed the test compound through their roots, after which the treated plants are inoculated with Fusarium. The two most effective materials discovered so far are CC 1182 (4-chloro-3, 5-dimethylphenoxy ethanol) and HD 109 (the potassium salt of 2-carboxymethylmercaptobenzothiazole). Saul Rich, *Market Growers Journal*, p. 22-23, Nov., 1954.

Cherry Fruit Fly Control

No sizeable change in toxicity to the cherry fruit fly resulted from combining methoxychlor and parathion, as revealed by recent studies covering the 1952-53 seasons in Yakima Valley, Washington.

Although residues following treatment with emulsifiable methoxychlor were generally higher than with wettable methoxychlor, the emulsifiable type caused lower mortalities. Emulsifiable formulations seemed to be less effective than the wettable formulations because of some inherent quality of the adjuvants.

Wettable parathion gave both greater deposits and higher fly mortalities than the emulsifiable parathion. When emulsifiable parathion was applied at twice the dosage rate of the wettable type, approximately equal results were obtained in percentage mortalities and residues. Apparently the variation in effectiveness of the two types of parathion formulations is due mainly to differences in deposition.

The residual LD/50 for methoxychlor (wettable), parathion (wettable), and the combination of methoxychlor and parathion was established at approximately 6 days following the applications, under the conditions of the test.

A definite correlation was established between insecticidal residues and fruit fly mortalities.

The LD/95 of methoxychlor for the cherry fruit fly, in laboratory tests, was about 33 times that of parathion for the first 24 hours. However, the commonly employed field dose of methoxychlor for the cherry fruit fly is only 4 times that of parathion. Results show that parathion would have to be applied at this seemingly excessive dosage rate in the field to obtain the necessary residual action for practical control.

The combination of methoxychlor and parathion gave an LD/50 and an LD/95 which were essentially equivalent to the combined values of one-half of the LD/50s and LD/95s for the materials applied separately. C. A. Johansen, W. E. Westlake, Lillian I. Butler, and R. E. Bry, *J. Econ. Ent.*, #5, 746-749 (1954).

Phosphate Spray Investigated for Cattle Grub Control

An experimental, phosphate-type insecticidal spray that is lethal to the cattle grub has been found by entomologists of the U. S. Department of Agriculture. The spray is said to be as effective as the standard rotenone. The material, designated for simplicity as 21/199 is, technically, 3-chloro - 4-methylumbelliferone *O,O*-diethylthiophosphate.

Entomologists A. R. Roth and Gaines W. Eddy report that a 0.5 percent spray of 21/199, applied to the backs of nine grubby cattle, killed all the grubs—245 of them—in less than a week. In comparable tests, rotenone sprays resulted in a 84 per cent kill the first week; 91 per cent by the end of the second week.

21/199 and two other experimental organic phosphates were also proved to be completely effective against cattle grubs when applied as washes to the backs of infested cattle. (These chemicals were: 3-chloro-methylumbelliferone *O,O*-dimethylthiophosphate and *O, O*-dimethyl - 1 - hydroxy - 2,2,2, - trichloroethylphos - phate.)

Apparently, the three phosphates kill grubs by direct contact. As grubs reach a late stage of development within the body of cattle, they form cysts under the skin of the backs of the animals and make a hole in the skin. Trace amounts of the insecticidal spray or wash penetrate these holes to the grubs, causing their death.

Study on General Insecticide

Kentucky Agricultural Experiment Station, Lexington, Ky., in its latest annual review of station activities, reports on investigations to formulate a practical general purpose insecticide. With the advent of methoxychlor, perthane and malathion, says the progress report, "it has become possible to combine two materials which possess such characteristics as low mammalian toxicity, short residual periods, effective insecticidal action against chewing and sucking insects and good acaracidal qualities."

With zineb to control various plant diseases, two general purpose insecticides were formulated and tested. One mixture contains 3 per cent methoxychlor, 5 per cent malathion and 5 per cent zineb. The other formulation contains 5 per cent malathion, 3 per cent perthane and 3.9 per cent zineb.

Applications of these two formulations were made to ten garden vegetables with excellent control of eight insects and mites attacking these crops. The only marked difference in performance was in control of the imported cabbage worm and the cabbage looper. The mixture containing methoxychlor attained about 79 per cent control of these two pests, while the mixture containing perthane gave 96 per cent control.

In experiments over four years in control of corn rootworm the Kentucky station reports that increases in corn yields have resulted from application of various chlorinated hydrocarbon insecticides to the soil at planting time and that these increased yields do not necessarily seem to be the result of insect control. Plants have grown faster, have tasselled earlier and have produced more silage and grain.

To further investigate these effects, controlled greenhouse tests were conducted with the general objective of eliminating the insect microbiology of the soil in the field. Plants were grown in artificial culture and also in soil in pots, with aldrin and chlordane added in small amounts. "Increased plant height and heavier plant parts (tops and roots) resulted from introduction of aldrin or chlordane to the growing media. The quantity necessary to produce this general effect was 0.01 to 1.0 ppm in artificial culture and 1 to 3 lbs. per acre in soil."

In a study of horsefly control, groups of dairy cows were sprayed at 60 ml. to each cow with Sulfoxide-Pyrexcel, 1 part to 9 parts water and with Sulfoxide-Pyrexcel, 1 part, with Thanite, 1 part, in 18 parts of water.

Horsefly repellency was excellent with both materials immediately after spraying and 24 hours after, the report states, but 48 hours later repellency was poor. Hornfly control was also rated excellent with both materials throughout the tests. The same materials were tested again at the same dilution, but 130 ml. of spray was used for each cow. Sulfoxide-Pyrexcel gave about three days' protection from both horseflies and hornflies, but the compound with Thanite added gave about two days of fairly effective protection from both pests.

In another test involving houseflies in dairy barns, malathion and diazinon sprays were used with excellent initial kills. Four weeks after treatment the diazinon was still killing flies. No malathion residues were found in milk from cows in a barn sprayed with that insecticide.

Tests with various insecticides were made on grasshoppers infesting fields of alfalfa, red clover, native pastures and tobacco. All insecticides were applied as emulsion concentrate sprays at 5 gals. spray per acre by a low-pressure boom sprayer, except in the tests on tobacco, where 6 gals. per acre were applied with a manually operated two-row sprayer.

The following insecticides at the indicated dosages an acre gave 95 per cent control or better on the forage crop tests: Aldrin at 4, 6 and 8 ounces; dieldrin at 4 and 6 ounces; endrin at 0.15, 0.2, 0.25 and 0.3 pound; toxaphene, 1.5 pounds; heptachlor at 4 and 8 ounces; and dilan at 1 pound. Endrin at 0.1 pound an acre gave between 80 and 90 per cent control in three tests.

In two tests on tobacco where individual caged plants were infested with known numbers of grasshoppers, endrin at 0.1 pound an acre gave 50 and 75 per cent control; endrin at 0.2 pounds an acre gave 85 and 100 per cent control; and endrin at 0.4 pounds an acre gave 95 and 100 per cent control.

No significant difference was found between the control obtained on immature grasshoppers and that obtained on adults. Some indications were noted that endrin applied during extremely hot and sunny weather was not as effective as when applied in cooler or cloudier periods.

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Spray Combinations for Apples

New spray combinations were used on McIntosh apples at the Mt. Carmel orchard, New Haven, Conn., to determine the reduction of injurious diseases and insects and also to study the flavor characteristics. Apples sprayed with a lead arsenate—glyodin—captan combination were preferred by a taste panel over the following combinations in decreasing order of preference: lead arsenate—captan, CS-708 — TDE — ferbam, methoxychlor — TDE — captan, CS-708—TDE—captan, methoxychlor—TDE—manzate, parathion—DDT—phygon.

The rather disconcerting feature of the 1953 taste panel's evaluations, however, concerns the reversal of the order of preference over that of pest control. Just what the reasons for this are, is not entirely clear, but it is suspected that some combination of sprays injured the leaves in the non-arsenical sprayed plots since the leaves turned yellow much earlier in the fall than with either lead arsenate—captan or lead arsenate—captan—glyodin. This was also true, but much earlier for the DDT—parathion—phygon treatment. It thus appears that whenever a spray is misapplied so that injury results—the effect becomes evident in impaired quality of fruit. P. Garmon, *J. Econ. Entomology*, 47, No. 5, 731-734 (1954).

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Foliar Spray Adds Nutrients

Cationic and anionic exchange complexes, representing much of a plant's biological activity, can take place through the foliar membrane as well as the root cell structure. Potassium and other nutrients, for example, are readily absorbed or washed out of the plant leaves.

A moderate amount of nitrogen can be applied as urea spray to tomatoes at the time of the regular spray program. Ten sprays of urea at weekly intervals with 1,500 pounds of an 0-10-10 fertilizer mixture produced comparable yields with 1,500 pounds of a 5-10-10 fertilizer. Better results, however, were obtained with a 3-12-12 mixture where the nitrogen was applied as a spray supplement. When urea was mixed with ammonium nitrate, twice as much nitrogen could be applied. A considerable portion of the nitrogen required by carrots can be applied in the normal three or four spray program for the control of diseases and insects. No incompatibility of the urea spray with the insecticides and fungicides normally used for tomatoes and carrots has been observed. Foliar sprays, in general, are considered successfully used as a supplement to regular fertilization. Jackson B. Hester, *Better Crops with Plant Food*, Vo. 38, No. 9 (1954).

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Forage Crop Pest Control

Research completed under the direction of Dr. George Gyrisco at Cornell Univ., Ithaca, N. Y., has laid the foundation for effective control of many forage crop insect pests. It is reported that insecticides don't increase yields very greatly during good forage growing seasons; but when dry weather comes and insects are plentiful, yield increases of more than 50 per cent have been obtained. Dr. Gyrisco's studies show a four-year average increase in forage yields of 25 per cent annually. Entomologists in adjoining states have had similar experiences.

Among the insecticides studied were aldrin, chlordane, DDT, lindane, strobane, and others. They were used in various combinations to control armyworms, grasshoppers, spittlebugs, clover root borers, and potato leafhoppers. In general, 2 sprayings are necessary for effective control of insects, one for each hay cutting. Care should be taken not to spray when hay plants are in bloom, to avoid killing bees. Spraying clover and alfalfa when in bloom is illegal in New York State.

Professor Gyrisco noted that before the advent of new insecticides during the past decade, insect pests on forage crops were difficult, if not impossible, to control. Rotations, clipping, drags, and machines were of little help. The forage yield increases obtained with the new insecticide treatments were the result of controlling a complex of several insect pests, rather than killing one particular bug.

Literature Available

The following list reviews a series of bulletins on fertilizer, insecticide and fungicide recommendations, controls, etc. For the most part, these bulletins and reports are prepared by the various state agricultural experiment stations, and copies may be obtained by writing directly to the respective stations.

FUNGICIDE-INSECTICIDE COMBINATION SEED TREATMENT OF BEANS FOR DAMPING-OFF AND SEED CORN MAGGOT. The fungicide component of the mixtures normally gives more consistent protection, but, an insecticide is necessary when there is danger of seed-corn maggot infestation. Nov. 1954 Bull. Michigan Agricultural Experiment Sta., East Lansing, Mich.

CHEMICAL FLY CONTROL. A cooperative fly control project involving ten dairy barns, three beef herds and a garbage composting unit is reported. Nov. 1954 Bull. Michigan Agricultural Experiment Sta., East Lansing, Mich.

SWEETPOTATO WEEVILS IN HAWAII THEIR BIOLOGY AND CONTROL, by Martin Sherman and Minoru Tamashiro. Results of field trials on the chemical control of weevils are discussed. Bulln. No. 23, Hawaii Agricultural Experiment Sta.

FEEDING HABITS OF THE TOMATO BUG, Cyrtopeltis (Engylatus) Modestus (Distant) with Special Reference to the Feeding Lesion on Tomato, by Y. Yanda and F. G. Holdaway. Bulln. No. 24. Hawaii Agricultural Experiment Sta., Univ. of Hawaii.

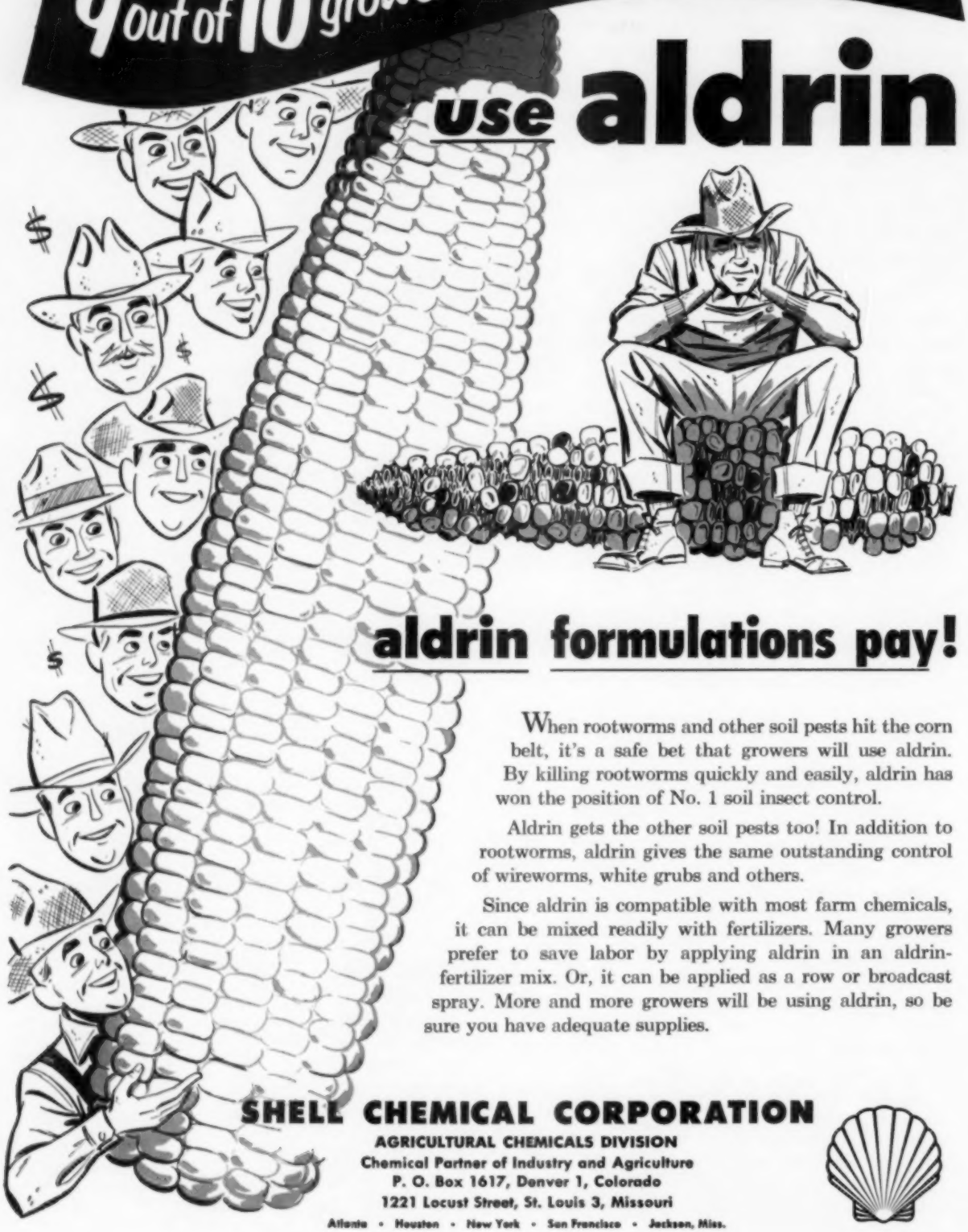
ARMY CUTWORM CONTROL IN ALFALFA, by R. E. Pfadt. Three chlorinated hydrocarbon insecticides appeared promising for control: endrin, dilan, and DDT. Chlordane, heptachlor, and toxaphene at normal dosages did not provide as good control. Circ. No. 41. Wyoming Agricultural Experiment Sta., Laramie, Wy.

RECOMMENDATIONS FOR WEED CONTROL IN WYOMING, by Dale W. Bohmont. Two new compounds are promising but require further study: Dalapon (a-a dichloropropionic acid) and PMR or URAB (Phenyl dimethylurea). Circ. No. 37. Univ. of Wyoming Agricultural Experiment Sta., Laramie, Wy.

WEED CONTROL IN SUGAR BEETS, by Dale W. Bohmont and Dean Swan. Results of tests on pre-emergence sprays applied after the beets were planted but before any growth appeared above ground. Bulln. No. 42. Univ. of Wyoming Agricultural Experiment Station, Laramie, Wy.

HOW TO CONTROL ALFALFA INSECTS, by T. R. Robb. Insecticide applications for controlling alfalfa weevil in hay alfalfa, and recommended insect control program for production of alfalfa seed. Leaflet No. 2, March, 1954. Univ. of Wyoming, Laramie, Wy.

9 out of 10 growers who treat for soil insects use aldrin



aldrin formulations pay!

When rootworms and other soil pests hit the corn belt, it's a safe bet that growers will use aldrin. By killing rootworms quickly and easily, aldrin has won the position of No. 1 soil insect control.

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INDUSTRY News

Velsicol Names New Adv. Mgr.

Lawrence E. Carls was recently appointed advertising manager of Velsicol Corp., Chicago. Mr. Carls will be responsible for coordinating advertising of all Velsicol products, including agricultural and household insecticides. He was previously advertising manager for International Register Co., Chicago.

Lawrence Carls

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New Fertilizer Firm

The Delta Chemical and Fertilizer Co. has been formed recently at Greenville, Miss. Mr. C. DeWitt Walcott, Sr., is president of the new organization. Facilities include an insecticide plant and a fertilizer mixing plant.

•

DeMaestri to Mich. Chem.

Fred A. DeMaestri was elected vice president in charge of operations of Michigan Chemical Corp., St. Louis, Mich., at a meeting of the board of directors, last month. Mr. DeMaestri was formerly with Ehret Magnesia Manufacturing Corp., Valley Forge, Pa., where he was technical supervisor.

•

Colorado Ags Meet Jan. 28

Highlight of the annual meeting of the Colorado Agricultural Chemicals Assoc. will be reports and discussion on the proposed changes in the agricultural chemicals recommendations for the ensuing season. The meeting will be held January 28 at the Cosmopolitan Hotel, Denver, Colo. J. Newton Hall is chairman of the publicity committee.

•

Chemurgic Group to Meet

The National Farm Chemurgic Council will hold its annual conference at the Dashler-Hilton Hotel. Columbus, Ohio, March 22-24, according to an announcement by Henry T. McKnight, president. Latest developments in agricultural research will be the chief topic. John W. Tickner, National Farm Chemurgic Council, New York, will be conference chairman.

•

Goodrich Names Modlin

B. F. Goodrich Chemical Co., Cleveland, announced last month the appointment of L. R. Modlin, Jr., as field sales manager in the general chemical sales department. Mr. Modlin, who received his Ph.D. in organic chemistry at the University of Virginia, worked formerly in Goodrich research and development of plastics and chemicals.

•

Potash Co. Canadian Mine

Potash Co. of America is preparing to sink a $3.5 million mine shaft at Patience Lake, Canada, in its second attempt to tap Saskatchewan's potash reserves, estimated by provincial geologists to be the most extensive in the world. Western Potash Corp., a Calgary firm, is also sinking a shaft at Unity, Sask.

Pitt. Coke Advances Three

R. L. Scott

Pittsburgh Coke & Chemical Co., Pittsburgh, announced three appointments, in the agricultural chemicals division. Dr. R. C. Scott will fill the newly created position of assistant to the manager of the agricultural chemicals division. He will coordinate the division's technical activities in relation to commercial development with emphasis on new products.

Dr. J. B. Skaptason was named coordinator of biological research, and Gordon M. Williams was promoted to agricultural chemical research supervisor.

•

Ellis Named Coml. Solv. V.P.

Snyder T. Ellis has been named executive vice president of Commercial Solvents Corp., New York. Mr. Ellis has been associated with CSC since 1951, and has been a member of the board of directors since 1953. He was formerly administrative vice president. He is a chemical engineer and graduate of Virginia Polytechnic Institute.

•

Intl. Min. Sales on Increase

Sales of International Minerals & Chemical Corp., Chicago, for the fiscal year ending June 30, 1955 will be over $100 million, according to a recent report by Louis Ware, president of the company. In 1954 the firm reported net sales of $93.6 million. The Bonnie phosphate chemical plant at Bartow, Fla., is expected to be operating at a profit within a few months.

Penick Appoints Seeland

Frank Seeland was recently appointed manager of the Insecticide Division of S. B. Penick & Co., New York. Mr. Seeland has been active in the insecticide field for over ten years. Harold Noble continues as vice-president and a director of the company.

•

Pac. NW Ag. Chem. Conference

The second annual Pacific Northwest Agricultural Chemical Industry Conf. will be held at the Imperial and Benson Hotels, Portland, Ore., Jan. 19-21. Among the discussions scheduled for the 3-day sessions is a summary of research reports given at the Pacific Northwest Vegetable Insect Conf. Other topics for review will be: "Virus Transmission (potatoes, strawberries), Clark Amen, Oregon State College; "Weed Problems," Virgil Freed, Oregon State College; "Current Status of 2,4-D in Washington," G. W. Fisher, State College of Washington; "Recent Developments in Pest Control in the British Columbia Fruit Industry," James Marshall, Dominion Entomological Lab., Summerland, B. C.

The second day of the meeting will feature a panel on "Registration and Toxicity of Agricultural Chemicals." Panel members are P. O. Ritcher, Ent. Dept., OSC; H. Patterson, Oregon State Dept. of Agriculture; R. W. Every, OSC; Dr. Sullivan, Oregon Bureau of Industrial Hygiene. Reports scheduled for Jan. 20 are: "Pesticide Tolerances," D. W. Dean, USDA; "Field Work on Insecticides and Public Health," Wm. M. Upholt, U. S. Public Health Service; "Legislation," Keith Syme, Chipman Chemical Co., Portland, Ore.; "Problems Involved in Recommending Insecticidal Dosages," J. H. Pepper, Montana State College; "Developments in Grasshopper and Mormon Cricket Control," F. T. Cowan, USDA; and "Systemic Insecticides, Rosmarie von Rumker, Chemagro Corp., New York.

The meeting will close with a summary of research reports given at the Northwest Co-operative Spray Project. O. B. Hitchcock, Chemagro Corp., New York, is conference chairman.

•

Hercules Adv. Mgr. Dies

Bronson B. Tufts, office and production manager of Hercules Powder Company's advertising department, died suddenly last month at his home in Arden, Del. Mr. Tufts had served with Hercules for 39 years.

He was founder and editor of Hercules' magazine "The Papermaker."

•

Summit Completes New Plant

Summit Mining Corp., Carlisle, Pa., announced recently the completion of a sericite plant at Aspers, Pa. Construction of the plant was begun last September.

•

New Shell Herbicide

Shell Chemical Corp. recently developed an allyl alcohol contact herbicide for use against weed seeds in tobacco beds.

Known as "Shell A-A-Weed Seed Killer," it is applied as a drench and becomes a gas once it is in the soil. Shell claims that the product does not require covers or special treatment after application. The tobacco seed bed, Shell says, can be planted from ten days to two weeks after application of A-A without harming germination.

•

Swift Has New Fert. Formula

Swift & Co. has announced the successful development of a fertilizer formula which slows down the leaching out of nitrogen. According to a company spokesman, the product will be manufactured at Swift's St. Louis factory in time to supply the spring market.

Butler Joins Std. Agricultural

Standard Agricultural Chemicals, Inc., Hoboken, N.J., has appointed Dr. Leland G. Butler director of technical service and development for the eastern U. S. area, effective January 1. Dr. Butler, an agronomist and weed specialist, recently spent a year in Venezuela experimenting with chemical weed control on food crops. His headquarters will be in Hoboken.

•

SW Branch ESA Names Early

The southwest branch of the Entomological Society of America elected Douglas Early, Los Fresnos, Texas, 1955 chairman at its recent Houston meeting. Charles L. Smith, Kerrville, Texas, was elected vice-chairman, and G. A. Bieberdorf, Stillwater, Okla., a member of the executive committee.

Other officers, continuing two year terms, are Charles A. King, Jr., McGregor, Texas, Sec.-Treas.; and Dr. J. C. Gaines, College Station, Texas, representative on governing board.

•

Fert. Increases Rice Prod.

Advances in California rice production as related to recent fertilizer experiments were reported by the California Fertilizer Assoc. Drilling fertilizer under the ground surface into the root zone has proved a successful method of application according to the report.

The following chart published by the association indicates yield, percentage of increase, and gross dollar gain over unfertilized plots. Of particular interest is the increased yield resulting from application of 4-20-4 as compared with 4-12-4, pointing up the advantages of mixtures containing phosphorus.

Fertilizer	Amount Applied Per Acre	Yield in Pounds Per Acre	% Increase	Gross Gain @ $4.50 Per Sack
4-20-4	150	4,727	12.31	$23.31
4-20-4	300	4,694	11.52	21.83
10-20-0	150	4,548	8.05	15.26
20-6-0	100	4,524	7.48	14.18
16-20-0	120	4,640	10.24	19.40
4-12-4	150	4,234	.59	1.13
Check Plot	None	4,209	—	—

New Ammonia Urea Plant of Grace Chemical Co. at Memphis, Tenn.

Grace Begins Prod. at Memphis

Production of anhydrous ammonia was started at Grace Chem. Company's new ammonia urea plant at Memphis, December 21. Officials of Grace and Swift & Co. participated in a brief ceremony marking the shipment of the first tank carload of anhydrous ammonia from the plant. William P. Gage, president of Grace, predicts the plant will reach or exceed its rated capacity of 250 tons daily in the near future. Overall view of new plant is shown at left.

•

Seek DDT for Export

The General Services Administration has asked suppliers to furnish 16,596,000 pounds of DDT early this year for use in the health programs of India, Indo-China, Iran, Pakistan, and the Philippines.

The purchase is being made through Foreign Operations Administration financing and the material is to be delivered between Jan. 15 and April 15.

Report Phosphate Spray

An experimental, phosphate type spray has been tested by U. S. Department of Agricultural entomologists and found to be more effective against the cattle grub than rotenone. The name of the spray is temporarily designated as 21/199. Until more tests are run with 21/199, use of rotenone is advised.

•

New Pennsalt Office

The new Agricultural Chemicals Northern Division office of Pennsylvania Salt Manufacturing Company of Washington opened in Aurora, Illinois December 1st. Aurora, a community of about 51,000, conveniently located to Chicago, was selected to provide a more central point in the northern 26 states from which Pennsalt's "Penco" line of agricultural chemicals could more effectively be served by sales and service personnel.

In charge will be Charles G. Whinfrey, Jr., northern division sales manager, formerly of Philadelphia. He is a graduate of Rutgers and Cornell Universities and has seven years service with Pennsalt as well as naval service during World War II. Assisting will be Harold L. Lindaberry, technical service.

In addition to clerical and accounting staff, other sales and technical service representatives reporting to this new office are located in states of Pennsylvania, Indiana, Missouri, Connecticut and Maine.

USDA Revises Interpretation of Pesticide Label Precautions

A REVISED interpretation of the warning, caution, and antidote statements required to appear on labels of economic poisons in compliance with the Federal Insecticide, Fungicide, and Rodenticide Act was issued last month by the U. S. Department of Agriculture.

Officials of USDA's Plant Pest Control Branch, which administers the Act, state that the revised interpretation No. 18) differs from the original interpretation 18 of November 14, 1949, in these two major ways:

1. The listing of specific chemicals to which this interpretation applies has been brought up to date by the inclusion of 44 new precautionary label patterns.

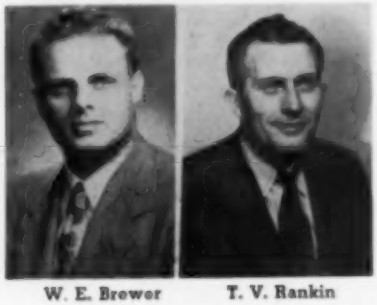
2. Fire hazard precautions have been modified.

In addition to these new inclusions, certain changes have been made in some of the original label patterns. For example, the warnings on DDT have been simplified while those on carbon tetrachloride have been strengthened. The complete revised interpretation appears in the Federal Register. A copy may be obtained from the Plant Pest Control Branch, Pesticide Regulation Section, U. S. Department of Agriculture, Washington 25, D. C.

Precautionary statements concerning fire hazards continue to be based on the flash point of the economic poison to be labelled. However, where previously it was necessary to include on the label of formulations having flash points below 80°F. such a statement as: "Danger—Extremely flammable. Do not use or store near open flame," this warning now more nearly applies to those formulations that have flash points at or below 20°F. This warning is suggested in the revised interpretation: "Danger—Extremely flammable. Keep away from fire, sparks, and heated surfaces." For those formulations with flash points between 20 and 80 degrees, a suggested label statement is: "Warning — flammable. Keep away from heat and open flame." For flash points between 80°

(*Continued on Page 115*)

Nopco Appoints Rankin



W. E. Brewer T. V. Rankin

Nopco Chemical Co., Harrison, N. J., announced recently the appointment of Travis V. Rankin as general sales manager in charge of sales at Nopco's Pacific Division. Mr. Rankin replaces Harold A. Swanson, who has become assistant vice president in charge of the Vitamin Division of Nopco.

Succeeding Mr. Rankin as Central district sales manager will be Walter E. Brewer, who will also continue in his present capacity as manager of Nopco's eastern industrial sales district.

•

Publish NFA Survey Summary

The National Fertilizer Association recently distributed to its members a bulletin describing the results of a survey conducted by the Chemical Control Section of the Plant Food Research Committee. The NFA has also published an organization chart and membership list of the Plant Food Research Committee for 1954-55. The list includes officers and members of the various divisions and sections of the committee.

•

Potomac Phytopaths to Meet

Potomac Division of the Phytopathological Society will hold its annual meeting March 3 and 4 at the Plant Industry Station, Beltsville, Maryland. Papers of general interest will be given in morning and afternoon sessions March 3 and a fungicide symposium, "Fungicides—Past, Present, and Future" will be held the morning of March 4. This symposium will be moderated by Dr. J. W. Heuberger and the speakers are: Dr. George L. McNew, director of the Boyce Thompson Institute for Plant Research, who will speak on the "History and Philosophy of the Use of Fungicides"; Dr. Hubert Martin, Science Service Laboratory, London, Ontario, will speak on "The Mode of Action of Fungicides"; Dr. T. Walter Reed, California Spray Chemical Corp. will discuss "Problems Encountered in the Commercial Production and Formulation of Fungicides"; and Mr. Lea S. Hitchner, executive secretary of the National Agricultural Chemicals Association, will review "Legal and Moral Aspects Encountered in the Use of Fungicides." Mr. Hitchner will place emphasis on public law 18 (Miller Bill).

The speaker for the annual banquet the evening of March 3 will be Dr. Karl D. Butler, who will discuss "The Future of Agriculture."

•

Pac. Div. of APS Meets

Crop rotation, plant disease control and the mode of survival of plant pathogens were featured in discussions at the Dec. 28-29 meeting of the Pacific division of the American Phytopathological Society at Berkeley, Calif.

William C. Snyder, University of California, opened the symposium on crop sequence and plant disease control. James B. Kendrick, Jr., University of California, reviewed the lima bean root rot problem, and James D. Menzies, USDA, discussed crop rotation and plant disease control.

•

Hercules Adds Managers

Hercules Powder Company, Wilmington, Del., recently reorganized its naval stores dept, adding two assistant general managers and three new divisions and division managers. The appointments are: Richard T. Yates, as manager of the agricultural chemicals div.; H. M. Wendle, manager of pine chemicals div.; and Donald H. Sheffield, manager oxychemicals div.

Arthur Langmeier, assistant general manager of Naval Stores since 1952, will be responsible for production and development. G. Fred Hogg, who was appointed assistant general manager, will be in charge of sales.

•

NFCC To Expand Activities

The National Farm Chemurgic Council, Inc., will launch a new effort to expand the nation's chemurgic research program, according to a recent announcement by Henry T. McKnight, pres.

TVA Curtails Fert. Program

The Tennessee Valley Authority announced in its annual report this month that its farm test-demonstration program has been further reduced during 1954. According to the report, at the close of the year there were 3,150 active test-demonstration farms, but TVA had curtailed production of concentrated superphosphate as private industry expanded.

The twenty year educational program carried on by TVA has increased industrial production of concentrated superphosphate from 68,000 tons in 1934 to 898,000 tons in 1953.

•

Gurney Switches to USDA

Ashley B. Gurney resigned last month as executive secretary of The Entomological Society of America to accept a position with the U. S. Department of Agriculture. A replacement for Mr. Gurney has not yet been appointed.

•

Sulfur Production Up

Recent figures show that production of sulfur from all sources in 1954 reached an estimated 6,600,000 long tons, 350,000 tons more than in 1953. Most of this production came from 13 salt dome deposits in Louisiana and Texas mined by the Frasch hot-water process.

The estimate of 6,600,000 long tons of sulfur is based on preliminary figures. Of the total, an estimated 5,450,000 tons is Frasch process sulfur, 350,000 tons is sulfur recovered from gases, 400,000 tons is sulfur contained in pyrites, and 400,000 tons is sulfur in various forms from other sources.

Output of Frasch sulfur was about 300,000 tons more than in the previous year. Output of non-Frasch sulfur increased about 50,000 tons over the previous year. A total of ten projects for recovery of sulfur from sour natural gas and refinery gases and for production of sulfur in various other forms went into production or neared completion in 1954.

As the new year begins, efforts to add further to the sulfur supply are continuing. These include a new Frasch project at Chacahoula dome in Louisiana and eight other projects.

NON-ACID FORMING

Twenty - four American and Canadian educators, research workers, and commercial representatives were named as fellows of the American Society of Agronomy at the organization's annual meeting in St. Paul, Minn., November 10. Shown here are 11 of the men who were honored for constructive leadership in crop and soil improvement. They are from left to right, front row, R. G. Shands, University of Wisconsin, Madison; J. B. Harrington, University of Saskatchewan, Saskatoon, Saskatchewan; R. H. Bray, University of Illinois, Urbana, Ill.; O. T. Bonnett, University of Illinois, Urbana, Ill.; J. R. Neller, University of Florida, Gainesville, Fla.; rear row, Orville Vogel, State College of Washington, Pullman, Wash.;; M. A. Hein, Forage and Range Section, USDA, Beltsville, Md.; F. E. Clark, USDA, Beltsville, Md.; S. D. Gray, American Potash Institute, Inc., Washington, D. C.; D. R. Dodd, emeritus professor of agronomy, Ohio State University, now living at Hedgesville, W. Va.; W. B. Andrews, Mississippi State College, State College, Miss.

Also named as fellows but not shown here are. K. H. W. Klages, University of Idaho, Moscow, Idaho; C. A. Lamb, Ohio State University, Columbus, Ohio; N. P. Neal, University of Wisconsin, Madison, Wis.;; T. E. Stoa, North Dakota Agricultural College, Fargo, N. Dak.; G. B. Bodman, University of California, Berkeley, Calif.; John Mitchell, University of Saskatchewan, Saskatoon, Saskatchewan; M. G. Cline, Cornell University, Ithaca, N. Y.; L. A. Dean, Division of Soils, Fertilizers, and Irrigation, USDA, Raleigh, N. C.; G. D. Smith, USDA Federal Soil Survey, Washington, D. C.; M. B. Sturgis, Louisiana State University, Baton Rouge, La.; Russell Coleman, National Fertilizer Association, Washington, D. C.; J. R. Taylor, Grand River Chemicals Division, John Deere and Co., Tulsa, Okla.; H. H. Tucker, Worthington, Ohio, formerly executive director, Coke Oven Ammonia Res. Bur.

Mo. Hort. Society Meets

Spray problems and control of fireblight were discussed at the 96th annual meeting of the Missouri State Horticultural Society, held January 3-4th, at the Daniel Boone Hotel, Columbia, Mo.

"Our 1955 Spray Problems" were covered by a panel consisting of H. G. Swartwout, Wilbur Enns, and Lee Jenkins. R. N. Goodman reviewed results of the 1954 program on the control of fireblight. During the same session, a panel of growers discussed their experiences in spraying for fireblight.

•

Agricultural Aerial Conf.

The fourth annual Ohio-Indiana Conference on the Use of Aerial Equipment in Agriculture will be held at Purdue University, Lafayette, Indiana, February 23-25, 1954.

Registration is scheduled in the Purdue Memorial Union Building, Wednesday morning, February 23. Four program sessions scheduled are as follows; General, Entomology, Agronomy, and Mechanical. The annual banquet will be held February 24th. Demonstrations of equipment will be made at the Purdue University Airport.

•

AMCA Report Available

Copies of the official proceedings of the joint annual meeting of the American Mosquito Control Assoc. and the New Jersey Mosquito Extermination Assoc. are now available, according to an announcement by Dr. Bailey B. Pepper, secretary of the New Jersey association. The meeting was held last March in Atlantic City, N. J.

Of special interest, according to Dr. Pepper, is the report of a panel discussion on 1) the use of granular insecticides, 2) organic phosphates in mosquito control, 3) mosquito resistance to insecticides, and 4) toxicity to man and animals of insecticides used in mosquito control. Copies of the report may be obtained at cost by writing to the Department of Entomology, Rutgers University, New Brunswick, N. J.

•

Shade Tree Meet Feb. 23-25

The 10th annual meeting of the Midwestern Chapter of the National Shade Tree Conference will be held February 23-24-25, 1955, in the Chase Hotel, St. Louis, Missouri. The program is directed primarily to discussion of problems of concern to those who perform tree work in the midwest, but included also will be topics of interest to arborists from all sections of the country. On the program for the 3-day session are the following reports:

"Tree Diseases in the Midwest," by Dr. T. W. Bretz, University of Missouri, Columbia; "Trace Elements and their effect on Plant Life," by Dr. E. R. Spencer, Lebanon, Ill.; "Concentration and Timing of Antibiotic Sprays for Control of Fire Blight," by Dr. Robert N. Goodman, University of Missouri, Columbia; "Weather Effects on Tree Growth," by August P. Beilmann, Missouri Botanical Garden, Gray Summit, Mo.; "Dutch Elm Disease and Elm Phloem Necrosis," a film presented by E. Herrbach, Standard Oil Company, Chicago.

•

M. S. Hodgson Dies

Funeral services for Morten S. Hodgson were held Dec. 5 at Athens, Ga. Mr. Hodgson was president of Hodgson, Inc., fertilizer manufacturers, formerly known as the Empire Chemical Co. His death followed a heart attack. He was 65.

•

Costa Rica Pesticide Rules

The manufacture, mixture, import and sale of pesticides for agricultural purposes in Costa Rica now requires the prior approval of the Costa Rican General Directorate of Agriculture and Livestock. Applications for registration must include data on physical and chemical properties, analytical methods, recommended uses, dangers and precautions, etc. Pesticides, fungicides, herbicides are affected by the ruling.

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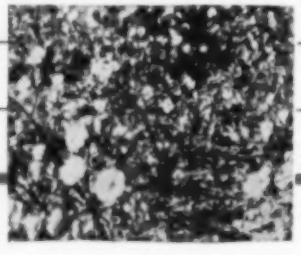

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N. E. Weed Conference in New York, Jan. 6-7

PROBLEMS in registration, results of research and field studies, progress reports, equipment factors affecting application of herbicides etc., highlighted the ninth annual meeting of the Northeastern Weed Control Conference held January 5-7 at the Hotel New Yorker, New York City. More than 1000 members and guests attended the three-day meeting at which 1955 herbicide recommendations for the northeast were presented.

Considerable interest was shown in a report by J. A. Noone, of the National Agricultural Chemicals Association, Wash. D. C., on problems in the registration of new herbicides. Mr. Noone outlined the legal requirements of registration as they affect the herbicide industry.

Several discussions on application equipment emphasized the increased interest in the mechanics of use of herbicides and the advances made along these lines. A report by L. E. Creasy and C. E. Wilson, Jr., E. I. du Pont de Nemours & Co., Inc., Wilmington, dealt with "Equipment Factors Affecting the Application of Wettable Powder Formulations of Substituted Urea Herbicides." E. D. Markwardt, Cornell Univ., Ithaca, reported for the coordinating committee on application equipment.

Equipment available for applying solubles, emulsions and wettable powders was discussed by E. D. Markwardt and W. W. Gunkel Cornell Univ., Ithaca.

R. E. Patterson, S. M. Raleigh and P. M. Anderson, Pennsylvania State University, State College, Pa., presented a report on a comparison of boom vs. boomless sprayers.

Promising new herbicides were reviewed by R. J. Aldrich, USDA, New Brunswick, N. J.; while L. H. Hannah, Monsanto Chemical Co., St. Louis, outlined results of field studies with one new class of herbicidal chemicals.

A review of recent advances in chemicals and practices in weed control among various crops was presented by E. R. Marshall, G. L. F. Soil Building Service, Ithaca; while C. J. Willard, president of the American Society of Agronomy, reported on "Weed Control; Past, Present, Prospects."

Among some of the specific research reports presented at the conference were the following: "Comparison of Granular and Spray Applications of Herbicides on Vegetable Crops", L. L. Danielson, Virginia Truck Exp. Sta., Norfolk, Va.

"Progress Report on Mode of Action Studies with CMU", W. H. Minshall, Science Service Laboratory, London, Ontario.

"Visual Aids to a Weed Control Program", D. A. Schallock, Rutgers Univ., New Brunswick, N. J.

"Pre- and Post-emergence Weed Control in Sweet Corn," S. K. Rice and B. H. Grigsby, Michigan State College, East Lansing, Mich.

"Selective Herbicides for Tomatoes", R. D. Sweet, G. Crabtree, C. B. Sayre and L. Feddema, N. Y. State College of Agriculture, Ithaca.

"Progress Report on the Use of Experimental Herbicides Natrin 80S in Tomatoes," R. J. Zelder, Carbide and Carbon Chemicals Co., N.Y.

"Chemical Defoliation of Red Kidney Beans", R. Tang and A. R. Hanson, Cornell Univ., Ithaca.

"The Effect of Oil Sprays with Various Aromatic Contents on the Kill of Common Weeds", E. J. Eliason, N. Y. State Conservation Dept., Albany, N. Y.

"Chemical Weed Control in Field Corn", J. Vengris, Univ. of Mass., Amherst, Mass.

"A Report on the Response of Cultivated Oats to 2,4-D and MCP Treatments." C. G. Waywell, Ontario Agr. College, Guelph, Ontario.

"The Effect of Spray Volume and Rate of DN Herbicides on Weed Control and Clover Stand in Underseeded Oats". M. F. Trevett, Maine Agricultural Exp. Station, Orono, Me.

"Comparison of Field Tests of Standard and New Brush Killer Formulations", W. A. Meyers, W. W. Allen and R. H. Beatty, American Chemical Paint Co., Ambler, Pa.

"Discussion of Air Pollution Studies and Relation to Weed Control," general membership discussion.

•

Geigy Names Bernegger

Dr. Rolf Bernegger has been named manager of the Geigy Chemical Corp. plant at Cranston, R. I. He also will continue to act as head of the plant's production department. Don M. Jones has been named plant engineer at Cranston, succeeding Dr. S. Marsh, who recently resigned. A. Weisberg will continue to be in charge of purchasing and office administration.

Geigy's Cranston plant was acquired from Alrose Chemical Company in 1949. It manufactures textile auxiliaries and industrial chemicals, including the "Sequestrene" chelating compounds.

•

Changes at Dorr-Oliver

Dorr-Oliver, Inc., Stamford, Conn., a recent merger of the Dorr Co. of Stamford, Conn. and Oliver United Filters, Oakland, Cal. has announced the following personnel changes, effective Jan. 1:

C. W. Crumb, formerly sales promotion manager of Oliver United Filters, takes over that position in the joint corporation. C. M. Comstock, formerly assistant advertising manager of Dorr, is assistant sales promotion manager for Dorr-Oliver.

A. L. Morris, formerly advertising manager for Dorr, is director of public relations for Dorr-Oliver and will be responsible for product and technical publicity. R. D. Forger, formerly technical assistant in Dorr's advertising department, will continue in that job at Dorr-Oliver. Sutherland-Abbott of Boston, Mass., advertising representative for Dorr, will serve the new corporation.

•

N. J. Farm Supply Dealer Dies

Cranbury, N. J., Jan. 2—Ezekiel S. Barclay, president and founder of Chamberlin & Barclay, Inc., Cranbury, N. J., manufacturers of fertilizers, died in his home, January 1 after a long illness.

•

Joint Chem. Meet Scheduled

Chemicals in foods and feeds will be discussed at the joint meeting of the Commercial Chemical Development Assoc. and the Chemical Market Research Assoc., Jan. 20-21 at the Edgewater Beach Hotel, Chicago, and at Terre Haute, Ind.

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Cotton States ESA Conf.

Topics scheduled for discussion at the meeting of the Cotton States Branch of the Entomological Society of America at Tampa Florida, Jan. 17-19, include reports on fruit insects, insect survey problems, systemic insecticides, house fly and mosquito control, cotton pests, truck and field crop insect control, residues, forest insects, stored product pests, ornamental insects, and basic insect problems.

Chairman of the conference will be W. G. Bruce, Washington, D. C., assisted by vice-chairman J. G. Watts, Blackville, S. C. and N. G. Eden, Auburn, Ala., secretary-treasurer.

Among the speakers scheduled for the 3-day session are George C. Decker, new president of the Entomological Society of America; J. Wayne Reitz, University of Florida; A. W. Lindquist, Insects Affecting Man and Animals Section, USDA, Beltsville; and C. H. Hoffman, USDA, Beltsville. Herman S. Mayeux is chairman of the local committee on arrangements.

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Pennsalt Has New Plant

A new plant for the production of concentrated phosphoric acid was put into operation recently by the I. P. Thomas Div. of the Pennsylvania Salt Manufacturing Co. at its Paulsboro, N. J. works. The I. P. Thomas Div., recently acquired by Pennsalt, has been in business for 85 years.

The plant is rated to produce 25 tons of phosphorus pentoxide per day in the form of concentrated phosphoric acid, to be used primarily in making triple superphosphate and granular fertilizers.

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Union Carbide at New Location

Union Carbide and Carbon Corp. has moved its five divisions to a single location at Lakeside Ave., Cleveland. The new office building houses Carbide and Carbon Chemicals Co., Bakelite Co., Electro Metallurgical Co., Haynes Stellite Co., Linde Air Products Co., and National Carbon Co. Previously the Carbide divisions had been at five separate locations. Carbide and Carbon Chemicals Co. markets synthetic chemicals, including "Crag" agricultural chemicals.

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Intl. Min. Adds Rhodes, Dyer

Bryce L. Rhodes and H. Clair Dyer recently joined the Phosphate Chemicals Div. of International Min-

B. L. Rhodes

H. C. Dyer

erals & Chemical Corp., Chicago. Mr. Rhodes was named development manager, in charge of development and promotion of new products. Before joining International, he was vice president of Synthron Inc., Ashton, R. I. Mr. Dyer will serve as eastern sales manager for special products.

•

Childs Heads SW Potash

Thomas W. Childs has been elected president of Southwest Potash Corporation, New York, succeeding Heath Steele, Mr. Steele had been head of Southwest Potash Corporation since the company was organized.

Fertilizer Safety Award

Employees of the Chatham (Ont.) Fertilizer Works of Canadian Industries, Ltd., were awarded the C-I-L Prize in ceremonies at the William Pitt Hotel, in Chatham, Nov. 19 in recognition of their record of seven consecutive years without an accident.

The award was presented by H. Greville Smith, president of Canadian Industries, Ltd. Mr. Smith said that the safety record represented 921,000 accident-free man hours. The accident rate in the industry as a whole is 9.9 injuries per million man-hours of work. There have been only seven lost-time accidents at the Chatham plant since 1937.

Following his remarks, Mr. Smith presented employees with individual awards.

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Build Seed Cleaning Plant

A $100,000 seed cleaning plant will be put into operation at Woodland, Cal. April 1st by C. M. Volkman & Co. Manager of the plant will be Harry D. Kinder, who is in charge of the field department for all California seed buying. The company plans to move its buying headquarters to Woodland.

Spray Operators Conference at Univ. Illinois Jan. 20-21

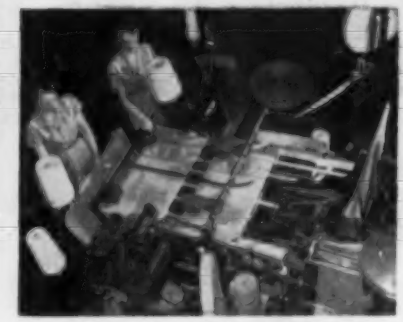
Agronomists and entomologists will report on latest pesticide developments at the annual Custom Spray Operators School at the University of Illinois, Jan. 20-21.

Agronomy topics will include spraying liquid fertilizer, brush control, new weed chemicals, new pre-emergence spraying methods, giant foxtail control, Johnson and quack grass control, use of low volatile esters of 2,4-D, and weed control in soybeans and corn.

Entomologists of the university and the Natural History Survey will report on the general insect situation, soil insecticide research results, research in control of chinch bugs and army worms, new methods and materials for fly control, forage crop insects and their control, problems in spraying elms for insect control, moral and legal responsibilities of spray operators, corn borer control, insect surveys, and new insecticides.

In addition to University scientists the list of speakers will include Robert Beatty of the American Chemical Paint Co., L. H. Hannah, Monsanto Chemical Co., D L. Klingman, United States Dept. of Agriculture, Irvin Borchers,. spray operator of Monmouth, who will report on his experience in spraying soil insecticides, and H. O. Hall, operator from St. Charles, who will report on results with fly control on dairy farms.

The school will be held in the Illini Union. Sponsored by the University and the Illinois Natural History Survey, it is expected to attract more than 500.



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Phillips Agricultural Project

Phillips Petroleum Co. has established the Phillips Agricultural Demonstration Project, located four miles north of Foraker, Osage County, Oklahoma. Many demonstration projects involving fertilizer as well as other agricultural petrochemicals will be under study.

Phillips Agricultural Demonstration Project is designed to study the feasibility of using nitrogen and phosphate fertilizer materials on native and introduced grasses and legumes, the economics of revegetating areas previously cultivated, and range land conservation and management. Also under study will be the adaptability of various plant species and selected varieties so important in pasture improvement. This will include the gathering and propagation of wild native legumes such as: Illinois bundle flower, prairie clover, wild alfalfa and Baptasia.

Other projects planned involve the use of various farm chemicals and petroleum products in grassland farming as well as measurement of results through animal unit production.

Phillips Agricultural Demonstration Project will provide a practical demonstration area where farmers and ranchers, technical specialists, students and others with agricultural interests can observe the various projects under way. Demonstrations will be undertaken with the cooperation of local, state, federal and related agencies.

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Liquid Vs. Solid Fertilizer

There is no reason for using liquid fertilizers unless they are cheaper in price than fertilizers in bags, says Harold F. Miller of the University of Kentucky College of Agriculture and Home Economics.

A hundred pounds, or about 10 gallons, of 5-10-10 fertilizer contains the same quantity of nitrogen, phosphoric acid and potash as 100 pounds of 5-10-10 fertilizer in bags. So notes Miller, "the important consideration in determining whether or not to purchase liquid or solid fertilizers is the comparative cost per unit of plant food applied on the land." An increasing number of fertilizers have of course come on the market in recent years in which plant food is supplied in liquid form.

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Brea Forms Nitrogen Div.

The Amm-o-gro Division of Specialty Oil Products Co. was established recently to market anhydrous ammonia produced by Brea Chemicals, Inc., Los Angeles. Amm-o-gro will immediately begin activities in the promotion, sale, transportation, and storage of anhydrous ammonia.

S. American Ag. Chem. Plant

Quimicas Agricolas Centro-Americanas, Ltda., San Jose, Costa Rica will shortly complete construction of a new agricultural chemicals plant in San Antonio de Belen. J. P. McKenna is in charge of design and construction of the plant which is scheduled to be in operation early in 1955. U. S. equipment already installed in the Costa Rica plant includes a No. 3036 Raymond roller mill and a hammermill pulverizer. The Raymond mill is the first roller mill installation in Central America.

New Herbicides Discussed at N. Cent. Weed Conference

Two new pre-emergence herbicides which may solve the troublesome problem of weedy grasses, particularly in grass crops such as corn, were described at the 11th annual North Central Weed Control Conference held December 6-9 at the Gardner Hotel, Fargo, N. D.

Dr. L. H. Hannah, of Monsanto Chemical Company's Organic Chemicals Division, said that the new weed killers, alpha-chloro-N,N-diallylacetamide and alpha-chloro-N,N-diethylacetamide, have given excellent control of grasses at rates ranging from three to six pounds per acre Effective weed control was obtained in corn and soybean rows by 13-inch band treatments with less than two pounds per acre.

"Although these amides of chloroacetic acid show definite promise as grass-specific pre-emergence herbicides," Hannah said, "they are still in an experimental stage and we estimate that at least another year of cooperative field trials with growers and experiment stations will be needed before their sale will be permitted."

The results of tests in 2700 widely-scattered plots indicate that under most conditions the new products are superior herbicides for such crops as sweet corn, onions, carrots, broccoli, spinach, snapbeans, lima beans, turnips, radishes and table beets.

In addition to such annual grass pests as giant foxtail, wild oats, cheat grass and crabgrass, satisfactory control was obtained of certain broadleaf weeds such as pigweed and purslane.

There was no apparent stunting of crops or reduction of yields reported, Hannah said, even at a 12-pound per acre rate, with the exception of cucurbits. When both pre-emergence and post-emergence applications were made, slight injury was noted in alfalfa, ladino clover, red clover and birdsfoot trefoil.

"Laboratory data show that the chloroacetamides are quickly adsorbed by the organic matter and clay in the surface layer of the soil, but not readily reversible," Hannah said.

"Unlike most other herbicides, it appears that organic matter may play an important favorable role in successful weed control with these new materials. They are highly effective on heavy clay soils, also." Because of their relatively high water solubility, the new weed killers have been unusually effective in soils of low moisture.

The alpha-chloroacetamides break down to produce chemicals which occur normally in the soil with no lasting effects, Hannah said. The compounds themselves are slightly less toxic than DDT.

An earlier paper presented at the conference by P. C. Hamm and A. J. Speziale, of the company's agricultural research group, reported in detail on their studies of the relationship between the structure and the herbicidal activity of this new class of compounds, as well as a brief description of their chemical preparation.

New Director for Amer. Potash

Robert B. Coons

Robert B. Coons, vice president of American Potash & Chemical Corp., was recently named a director of the company. Mr. Coons, who is in charge of industrial relations, purchasing and traffic at American Potash, is also a director of the Plomb Tool Co. and of the Los Angeles Merchants and Manufacturers Assoc.

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New Stauffer Plant

Stauffer Chemical Co., San Francisco, recently announced plans to expand fertilizer manufacturing facilities at Vernon and Richmond, Calif. The first step in a program costing over one million dollars will be taken at Vernon where a new plant will be built capable of producing approximately 500 tons per day of pelletized superphosphate and other modern ammonium phosphate fertilizers. Completion and initial production are planned for mid 1955.

The new plants will offer the fertilizer manufacturing trade products for blending, as well as granular combinations of plant food.

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Monsanto Advances Holmes

H. Chandler Holmes was recently appointed advertising manager of the Inorganic Chemicals Div. of Monsanto Chemical Co., St. Louis. Holmes, who has been with Monsanto since 1951, was named advertising manager of the company's former phosphate division in June, 1952.

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Dorr-Oliver Calendars

The Dorr Co., Stamford, Conn., and Oliver United Filters, Inc., were merged effective January 1, 1955, under the name of Dorr-Oliver, Inc. The company has arranged to issue a series of calendars, illustrating Dorr equipment.

One such photograph shows potash production in New Mexico, illustrating use of the Dorr thickeners, classifiers and hydroseparator in the sedimentation, washing steps, and classification operations at the Duval Sulphur and Potash Co. plant near Carlsbad, New Mexico. A second calendar shows a three-reactor fluosolid system for pyrite roasting in a steel plant on the east coast.

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Intl. Minerals Advances Bellano

William Bellano has been appointed production manager of the Phosphate Chemicals Division of International Minerals and Chemical Corp., Chicago. Mr. Bellano will supervise the new phosphate chemicals plant at Bonnie, Fla., and be responsible for operations at Tupelo, Miss., and Wales, Tenn.

Ohio Pesticide Institute in Annual Conference

By J. D. Wilson, Secretary, OPI

THE Ohio Pesticide Institute, which was originally formed several years ago to keep the dealer informed concerning the latest advances in control measures and materials, held its eighth annual school and conference at the Neil House in Columbus on November 17th and 18th. Over twenty speakers, the majority of whom were connected with the Ohio Agricultural Experiment Station and Ohio State University, listed some of the results of their researches on pest control during the past summer and listed various changes in their control recommendations for 1955.

Researchers Alban, Saboe and Runnels gave recommendations for weed control in vegetables, soybeans and lawns, respectively, and Drs. Hibbs, Weaver and Schnitthenner discussed insect and disease control in field crops. Sleesman and Wilson did the same for insects and diseases of vegetables, together with projected changes in their control recommendations on vegetables for 1955. Lyle Goleman discussed his latest experiments in fly control. Also, in the evening of the first day, Frank Irons and Don Zimmerman reviewed some of the highlights of the New York Pesticide Conference held in Ithaca, N. Y., the week of Nov. 9th.

H. F. Winter discussed some of the outstanding results he obtained in 1954 on the control of fireblight of apple and pear by the use of antibiotics, and gave recommendations for the disease in 1955. Drs. Cutright and Rings reviewed some of the sidelights of their studies on insect control of pome and stone fruits in 1954, and R. B. Neiswander outlined some results of his work on the control of insects on ornamentals.

A diversionary action consisted of reports by Charles Reimer of the Dow Chemical Co. and W. E. McCauley of the Shell Chemical Corp. on the use of soil treatments for the control of nematodes, and soil-inhabiting diseases and insects of vegetables and forage crops.

An afternoon session included recommendations for the control of turf insects and diseases by Polivka and Runnels, respectively, of the Ohio Experiment Station at Wooster. Finally, B. F. Jansen, extension pathologist, and T. H. Parks, extension entomologist, listed the compounds that, in their opinion, the dealer should stock in 1955; and H. E. Bruner of the Roberts Chemical Co. outlined recommended herbicides for 1955.

Hold Joint Hort. Meeting

A joint meeting of the Sweet Potato Association and the Horticultural Society was held in New York, Dec. 2 and 3. Of particular interest to agricultural chemists were discussions by C. V. Hall, Kansas State College, on the use of chemicals to increase sprout production of sweet potatoes and Fred B. Hadle, Kansas State College, on the control of fireblight on apple trees with antibiotic sprays. At the opening session R. A. Schroeder, University of Missouri, spoke on current vegetable research in Missouri.

Atlas Has New Pension Plan

Atlas Powder Co., Wilmington, Del., initiated for its 4,000 employees a new pension plan, increasing retirement benefits and making them independent of social security benefits. A description of the plan is contained in the pamphlet "Facts About Your Atlas Pension Plan" now being distributed among Atlas employees.

•

Southern Phytopaths to Ky.

J. N. Sasser, N. C. State College, Raleigh, N. C. will preside at the opening of the three day annual meeting of the Southern Division of the American Phytopathological Society, February 7-9th at Louisville, Ky. The advance list of speakers includes: C. J. Nusbaum, Raleigh, N. C., who will report on the variable effects of nematocides on parasitic nematode populations in row fumigated tobacco plots. The session will be followed by a business meeting when 1955 officers will be elected.

During the afternoon, H. E. Smith, Fayetville, Ark., will discuss opportunity for improving agriculture in the south through plant disease control. C. J. Nusbaum and J. N. Sasser will give a joint report on the comparison of EDB (W-85) and DD applied as liquids and impregnated on vermiculite for nematode control. R. G. Henderson and A. S. Williams will discuss the effect of soil insecticide treatments on the alfalfa-stem nematode.

The meeting of the Cotton Disease Council will highlight the next day's activities. It will be a joint session with the Crops Section of the American Society of Agronomy, at which A. L. Smith, Auburn, Ala., will preside. Among the discussions scheduled is a review of soil borne fungus pathogens of grassland crops by Howard W. Johnson, Miss. Agricultural Experiment Sta., Stoneville, Miss. Lewis J. Allison, Raleigh, N. C., will report on nematodes and grassland crops; and Glen W. Burton, Tifton, Ga., on breeding for disease resistance in grassland crops.

Presiding over the final session will be W. W. Hare, State College, Miss. Other reports include: J. Taylor, Blairsville, Ga., "Apple Black Rot in Georgia"; L. C. Tims, La. State Univ., Baton Rouge, La., "Some Hosts of the Pink Root Fungus"; G. A. Brandes and D. W. Young, Rohm & Haas Co., Philadelphia, "Effect of Fungicides on the Survival of Cotton Seedlings"; and H. H. Foster, Clemson, S. C., "Peach Brown Rot and Scab Control in South Carolina."

J. H. Miller, University of Georgia, Athens, Ga., is president of the organization.

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Briefs on Tolerance Proposals

Tolerance regulations proposed by the Department of Health, Education and Welfare for chemical residues on fresh fruits and vegetables have been favorably received by most of the companies affected and by the farmer organizations, it was indicated last week.

The December 20 deadline for filing comments and criticisms against the proposals has passed with only a few major criticisms having been submitted. It is expected that the proposals will go into effect pretty much in their original form except for slight technical modification.

Among the few exceptions to the favorable reception to the proposals were briefs filed by Shell Chemical Corp., asserting that the definitions of aldrin and dieldrin would lead to confusion, and a brief by Dow Chemical Co. criticizing the listing of a dinitro compound as a miticide. Other criticisms were submitted by Velsicol Corp., Chicago, American Cyanamid Co., New York, Rohm & Haas Co., Philadelphia, and Virginia Carolina Chem. Corp., Richmond, Va.

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Special Formulations Req'd.

A recent notice from a New York chemical company describes a special insecticide formulation requiring malathion powders made up to contain 40% and 25% malathion. It is specified that such formulations are made by using American Cyanamid technical liquid malathion and Johns-Manville "Celite" as a diluent.

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McCauliff Reports Error

Dr. E. McCauliff, Glyco Products Co., New York, called our attention to a type-setting error in the December, 1954 issue of *Agricultural Chemicals*. Page 55 of the article "Chelates in Plant Nutrition" reports that "Foliage spray applications have so far been confined to crops in blossom or in fruit."

We wish to caution our readers that this statement is incorrect and that the statement should be that "Foliage spray applications have so far been confined to crops NOT in blossom or in fruit."

Handbook of Agricultural Pest Control

By S. F. Baily and L. H. Smith **192 Pages**

A PRACTICAL handbook of agricultural pest control, designed for use by the custom sprayer, the pest control operator, farm advisor, agricultural chemical salesman, county agent and field worker. This handbook covers the agricultural chemicals (insecticides, fungicides, herbicides, plant hormones, nutrient sprays, defoliants, etc.), their rates of application, useful formulas, as well as chapters on fumigation, spray machines, toxicology, dusts and dusting, aircraft, and mosquito control. Use the coupon below for your copy now!

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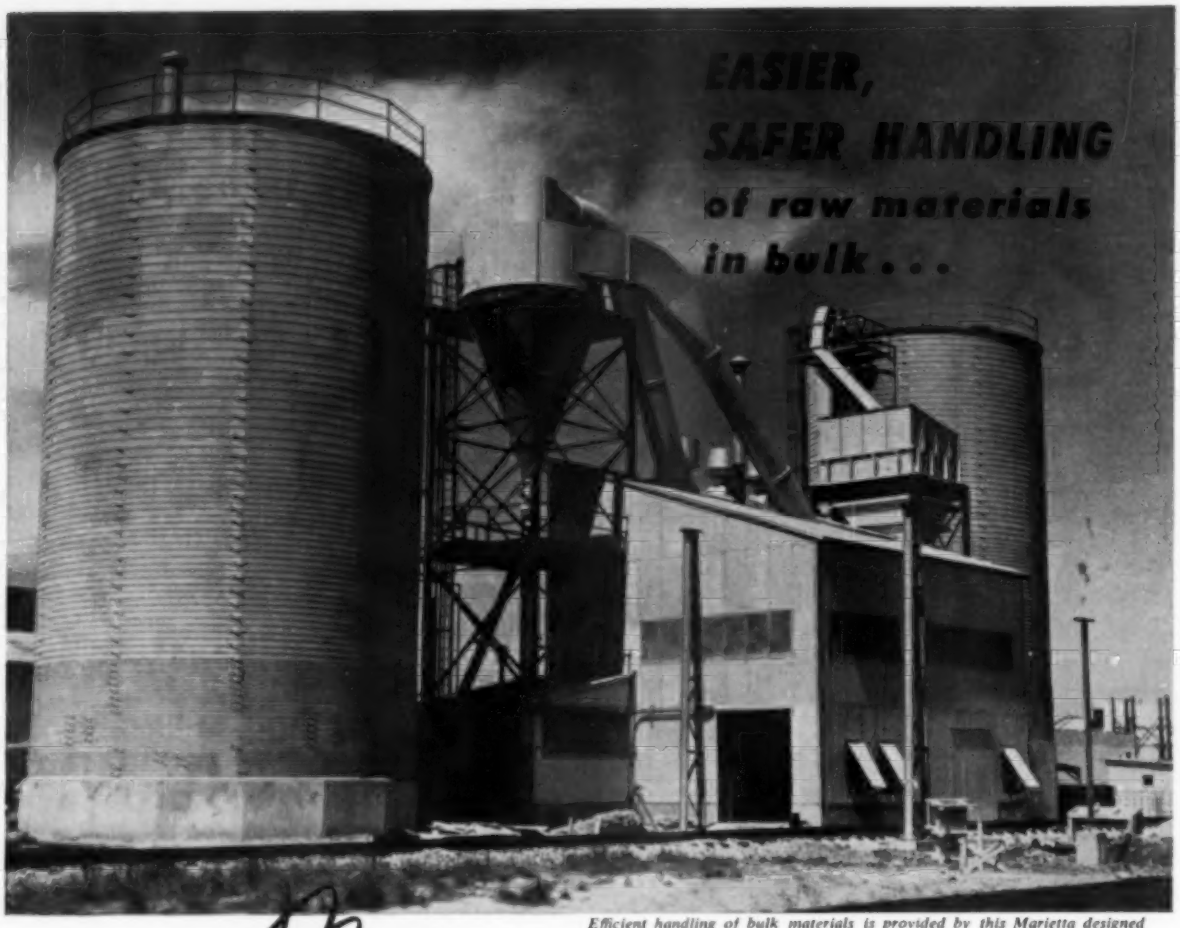

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Taylor Leaves Spencer

George Taylor recently resigned as director of product sales at Spencer Chemical Co., Kansas City, Mo. Harold E. Bingham, director of traffic, will fill the post temporarily.

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Pratt Moved to Paterson

After fifty years in the manufacture of insecticides in New York City and Hackensack, N. J., the B. G. Pratt Company have moved their office and plant to a new location in Paterson, N. J.—204 Twenty First Avenue.

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Fertilizer Safety Meet

The South Carolina Fertilizer Safety Section of the NSC recently held its first meeting at Spartanburg, S. C. Featured speakers were Vernon Gornto, NSC, and C. J. (Tex) Watts, Davison Chemical Corp. Alton L. Foster, International Minerals & Chemical Co., was elected 1955 Chairman. Next year's meeting is scheduled for Charleston, S. C., Nov. 1955.

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Grace Plant in Brazil

A five million dollar chemicals plant will be built in the Sao Paulo area of Brazil for the production of DDT, industrial solvents, and other chemicals, according to an announcement last month by W. R. Grace & Co., Farbwerke Hoechst A. G., and American Home Products Corp.

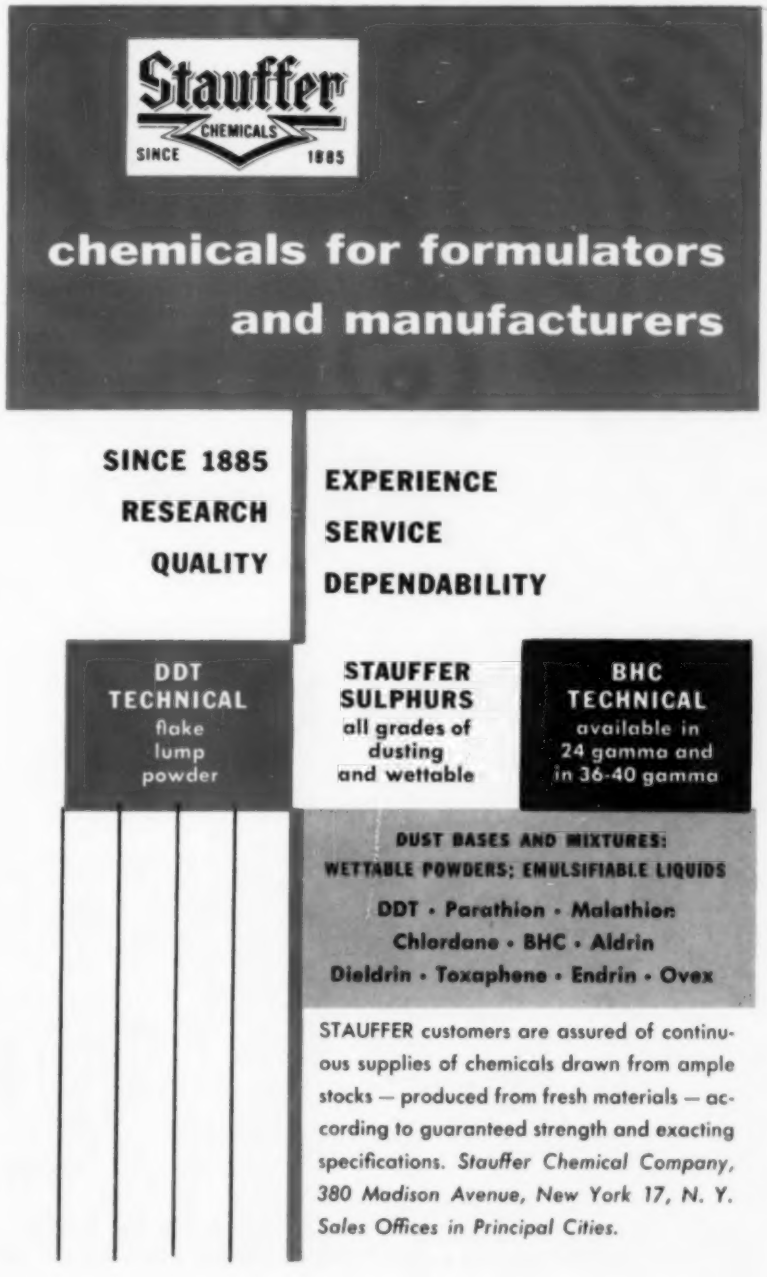
The three partners are forming a new company, tentatively known as Fongra Produtos Quimicos S. A., in which W. R. Grace & Co. and Farbwerke Hoechst A G. have equal participation and American Home Products Corporation a smaller participation.

Construction will begin early next year with full production planned for 1957. The plant will be situated at Suzano, located about 30 miles east of the city of Sao Paulo on the line of the Central Railway.

Total fixed investment in the new plant will be approximately $5,000,000. Earlier in December the Export-Import Bank of Washington announced that it had granted a credit of $1,500,000 to be used in financing equipment to be acquired in the United States.

Although W. R. Grace & Co. has long been active in the West Coast countries of South America and in Argentina through transportation, manufacturing, agricultural, and import-export activities, this is its first investment in a manufacturing operation in Brazil. Upon the recent merger of the Dewey & Almy Chemical Company into W. R. Grace & Co., Grace also acquired a new container sealing compound plant at Sao Paulo which was scheduled to go into production before the end of 1954.

Farbwerke Hoechst is a well-known German chemical firm which has an affiliate in the United States, American Home Products, which manufactures a broad line of ethical and proprietary drugs, insecticides, home products, and prepared foods. The German concern already has extensive investments in Brazil.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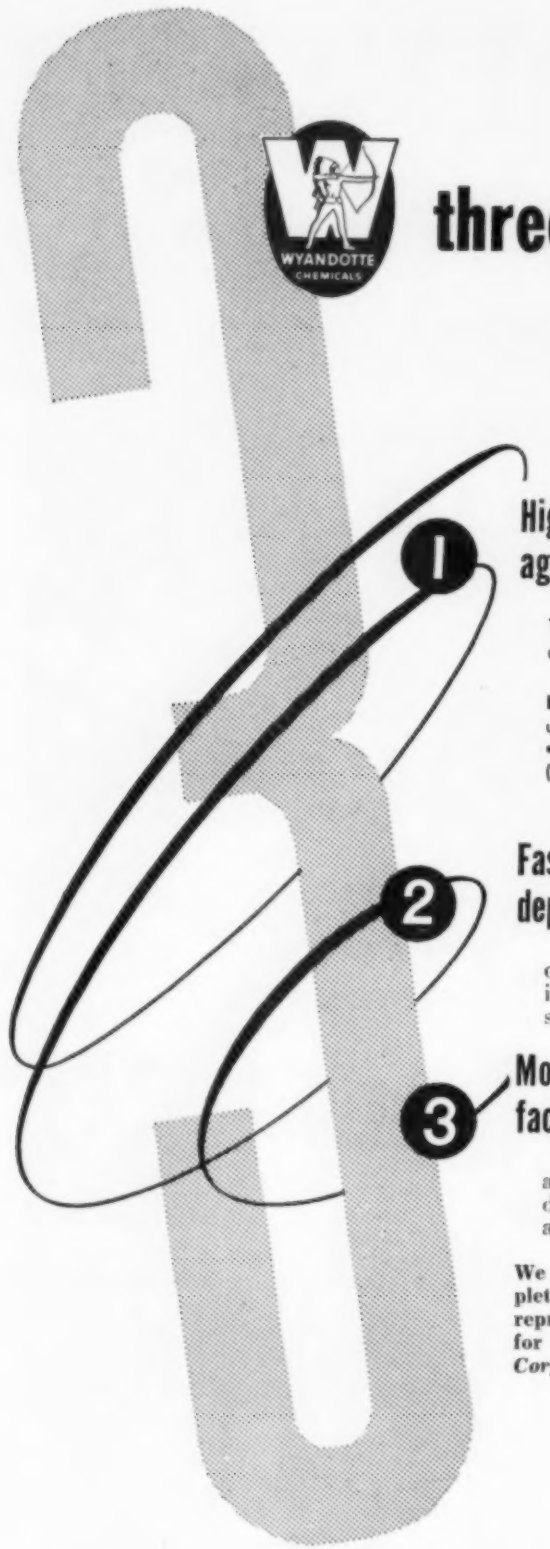

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Weed Conf. Scheduled

The eighth annual Southern Weed Conference will be held at the Soreno Hotel in St. Petersburg, Florida, January 17-19. Some of the topics to be discussed are research on basic herbicidal problems, extension aspects of weed control and agricultural engineering equipment. Sessions on the latest developments for controlling weeds in certain agronomic crops, cotton, brush and horticultural crops will be held.

Members of the publicity committee are Hoyt Nation, Dow Chemical Co., Greenville, Miss.; W. G. Westmoreland, North Carolina Extension Service, Raleigh, N. C. and chairman Leonard Lett, National Cotton Council of America.

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Standards Conference Held

Discussion of a program to develop simple common names for pesticides highlighted the Agricultural Symposium held during the fifth National Conference on Standards held November 15-17 at the Hotel Roosevelt, New York. H. L. Haller, USDA, reported that the use of initials or numbers, or a combination of the two, is undesirable because it has caused confusion in many cases in the past and also presents a problem in indexing, etc. Dr. Haller advised that a formal committee known as the ASA Sectional Committee K62 on Common Names for Pest Control Chemicals is currently preparing a procedure for the acceptance of an American standard common name for a pest control chemical. The "International Standards Problem of ISO TC/81 on Common Names for Pest Control Chemicals" was outlined by J. E. Archer, American Cyanamid Co., Stamford, Conn.

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Check Liquid Fert. Claims

The FTC has accused Ra-Pid-Gro Corp., Dansville, N. Y., a liquid fertilizer company, of false advertising, claiming among other things that there is no assurance that trees or plants dipped in "Ra-Pid-Gro" would grow. A hearing is scheduled for January 21 in Dansville. The commission advised also that Stern's Nurseries, Inc., Geneva, has agreed to stop using such advertising as "No plant food like Miracle-Gro . . . absolutely safe! . . Cannot burn . . Approved by agricultural authorities".

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Market Rodent Control Package

Hopkins Agricultural Chemical Co., Madison, Wis. is marketing a new rodent control package containing pelleted warfarin cereal bait and water-soluble warfarin for water baits. The package contains one pound of Redi-Mix Pellets and two, 1/3 ounce packets of Aqua-Deth water-soluble warfarin.

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CCDA in Chicago Jan. 20-21

The Commercial Chemical Development Association and the Chemical Market Research Association will hold a joint meeting Jan. 20-21, at the Edgewater Beach Hotel, Chicago, discussing "Chemicals in Foods and Feeds."

The first day of the meeting will be devoted to a discussion of markets. The second day will feature a panel discussion on the steps which must be taken to introduce new chemicals to the food and feed industries. A trip to the experimental farm of Chas. Pfizer & Co., located at Terre Haute, Indiana, is scheduled for January 19, the day before the opening of the general conference.

APFC Awards To Editors

A highlight of the annual meeting of the American Agricultural Editors' Association in Chicago in December, was the presentation of awards in the American Plant Food Council's "Soil Builders Award for Editors" contest. The contest was conducted with the approval of AAEA to honor farm magazine editors and writers " who most effectively carried the message of soil building to their readers during the past year." The winners were: Delmer E. Groves, associate editor of *The Ohio Farmer* and Wallace D. Inman, associate editor of *Capper's Farmer*. Certificates for "superior journalistic contributions toward the building of the soils of our nation" previously were awarded to two other individuals, Robert P. Crossley, editorial director, *Capper's Farmer* and Earl W. McMunn, editor, *The Ohio Farmer*.

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West. Cotton Conf. Mar. 8-9

The fourth annual Western Cotton Production Conference will be held at Hotel Westward Ho, Phoenix, Ariz., March 8 and 9, 1955. Sponsored by the National Cotton Council, the Southwest Five-State Cotton Growers Assn. and the Arizona Cotton Growers Assn., the conference is intended to provide growers with information on best methods of producing cotton in the southwest.

Fulton Bag Holds Sales Conference

Executives, branch managers and sales personnel of Fulton Bag & Cotton Mills met recently in Chicago to discuss plans for the coming year. Included in the group were: First Row (l to r)—Fred G. Barnet, Dallas; E. A. Cronheim, Vice-President and Secretary, Atlanta; Clarence E. Elsas, President, Atlanta; Jason M. Elsas, Executive Vice-President, New Orleans; E. Monroe Hornsby, New York; J. B. Cronheim, Vice-President, St. Louis. Second Row (l to r)—K. H. Kerr, Denver; Art C. Jones, St. Louis; Henry W. Meyerhoff, Kansas City; T. R. Moorer, Atlanta; A. J. Reinberg, Kansas City; Eugene Revelle, Denver; August Denk, Minneapolis; O. F. Littlefield, Savannah. Third Row (l to r)—Charles J. Bloom, New Orleans; Peter H. Walmsley, New Orleans; W. Frank Kerr, Los Angeles; Louis J. Even, New Orleans; T. Raymond Berry, Dallas; Eugene B. DuBois, Minneapolis; A. W. Moenkhaus, St. Louis; Meno Schoenbach, Dallas; Robert J. Gigler, Los Angeles; George W. Williams, Los Angeles.

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Books for Sale

Soils and Fertilizers

by F. E. Bear

375 pages, price $6.00

This text presents the basic scientific facts and principles behind the production and utilization of agricultural chemicals. The why, when, where and how of fertilizers is expressly discussed, with particular emphasis on the importance of lime and fertilizer materials in maintaining and increasing the productivity of soils.

Chemistry and Uses of Insecticides

by E. R. de Ong

445 pages, price $6.75

Written by an outstanding student of entomology and agricultural technology, this book covers all the major insecticidal agents in detail, describing not only their chemical nature and properties, but also their specific action on various types of insects, their methods of application, and their effect on animals and humans.

Soils and Soil Fertility

by L. M. Thompson

330 pages, price $5.00

This authoritative treatment begins by telling what soil is — what makes it up physically, chemically, biologically —and what its moisture-holding characteristics are. The use of commercial fertilizers and farm manure are other subjects under discussion.

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California Fertilizer Association Re-Elects R. H. Jones President

Top Photo: Paul T. Truitt, pres., American Plant Food Council, Washington, D. C.; Beverly H. Jones, pres., California Fertilizer Assoc., Fresno, Calif.; W. R. Allstetter, vice pres., National Fertilizer Assoc., Washington, D. C.; Jesse W. Tapp, vice chairman of the board, Bank of America, Los Angeles; Francis R. Wilcox, Sunkist Growers, Los Angeles.

Bottom Photo: New CFA Officers: Wm. E. Snyder, vice president, Los Angeles; Sidney H. Bierly, exec. sect. & mgr., San Marino; James M. Quinn, director, Los Angeles; Murray C. McNeil, director, Hayward; Beverly H. Jones, president, Fresno; Howard G. Conley, director, Los Angeles; Virgil A. Frizzell, secretary, Salinas; Howard H. Hawkins, director, Glendora; Jack Baker, treasurer, Los Angeles; W. L. Dixon, Jr., director, Oakland.

THE thirty-first annual convention of the California Fertilizer Association, held at Coronado, Calif., November 15 and 16, attracted an all time record attendance of 450. Millard E. McCollam, western states manager of the American Potash Institute, and for many years chairman of the Association's Soil Improvement Committee was honored as "Man-of-the-Year".

Jesse Tapp, vice chairman of the board of directors, Bank of America, Los Angeles, predicted a big new market for commercial fertilizers for use on pastures and rangeland. He said this trend will assure the high level of livestock production needed to meet growing food demands.

W. R. Allstetter, vice president, National Fertilizer Association, Washington, D. C., exhibited two films, one a television short showing typical plant food deficiency symptoms, and the other depicting the value derived from scientific soil testing.

Paul T. Truitt, president, American Plant Food Council, Inc., Washington, D. C., presented a paper on the fertilizer supply outlook and development of manufacturing facilities. He pointed out that for each of the past 16 years the fertilizer industry has marked a new consecutive high in terms of total amount of plant nutrients used. He predicted little change in general farm conditions in 1955, pointing out that the effect of smaller allowable acreages under the crop production control program will be offset by the need for providing more food and fiber for our rapidly increasing population. He expressed the feeling that the fertilizer industry will continue to supply the farmer with all the plant food which he will require from existing, building, and planned facilities, although it was pointed out that seasonal shortages of certain materials, especially heavily used mixtures, will still make it desirable for the farmer to purchase his requirements ahead of actual need.

M. E. McCollam, Soil Improvement Committee Chairman, reported on the activities of his committee during the past year, and stressed the importance of proper research and the acceptance of its results by the farmer. He reported that Arizona farmland received an average of 77 pounds of plant nutrient per acre last year, the highest in the nation. California was next with an average of 49 pounds per acre. The U. S. average was 15 pounds. He pointed out that these figures provide room for considerably more fertilizer use.

During the annual business meeting, three directors were elected for three year terms: Murray C. McNeil and William E. Snyder were re-elected to this office, and Fred Bryant, Brown and Bryant Co., Shafter, California, succeeds Wm. E. Simas, Salinas, on the board. Virgil A. Frizzell, the Triangle Co. Salinas, was elected secretary, succeeding H. E. Ferguson of San Francisco. Re-elected to serve during the coming year were president B. H. Jones, Fresno; vice president Wm. E. Snyder Los Angeles; treasurer Jack Baker, Los Angeles; and executive secretary and manager, Sidney H Bierly, San Marino.

Earle J. Shaw, Chilean Nitrate Sales Corp., Los Angeles, presents the "Man of the Year" for 1954 award to M. E. McCollam, American Potash Institute, San Jose, Calif.

New Insecticide Sprayer

A type of row crop insecticide sprayer using one-tenth as much water as conventional high-pressure spray rigs has been designed by Prof. James L. Brann of the Cornell entomology department and built by Prof. Wesley Gunkel of the department of agricultural engineering.

The rig is a larger model of a previously-built mist concentrate sprayer designed for muck-land crops. The sprayer has a 3-foot ground clearance, making it usable on row crops, such as broccoli, tomatoes, cabbage, potatoes, and young corn.

Using a blast of air to break the insecticide solution into many minute droplets, the sprayer distributes them over a 35 foot swath covering 10 rows of broccoli.

Since only 5 to 20 gallons of water are needed to spray an acre in this manner, the machine can treat more acres per hour than present high pressure sprayers which use 100 to 200 gallons of water in traveling over each acre and need more re-

filling time. Treating more acres at a trip saves machinery and labor costs and enhances the opportunity for timely spraying, Brann and Gunkel point out.

Good control of aphids on broccoli has resulted from spraying with 10 to 20 gallons per acre of insecticide solution. Mist sprayed broccoli plots had less than 1 per cent as many aphids as the untreated plots, and only one-third as many aphids as conventionally sprayed plots.

An advantage of the fine mist spray, according to the Cornell specialists, is thorough plant coverage. Swirling droplets are carried to the far sides of plants as well as to the undersides of leaves where insects eat.

To date this new model has been tested only for insect control on broccoli. Its success in this case has been so encouraging that it is hoped the sprayer will give satisfactory control of many pests on the larger row crops, such as potatoes and corn.

The small amount of liquid required and wide swath covered without manipulation of cumbersome booms should go a long way toward saving materials, man power, and time in controlling our vegetable insects and diseases, Dr. Brann said.

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Program for So. Weed Conf.

The eighth annual Southern Weed Conference, January 17-19, at Hotel Soreno, St. Petersburg, Fla., will attract hundreds of leaders from southern land grant colleges, USDA, agricultural chemical manufacturers, farm equipment manufacturers and farmers from all over the south. Following are highlights from the advance program:

January 17, Monday

Registration. Reports of research committees. Presiding will be G. C. Klingman, North Carolina State College, Raleigh. "Weed Control—The Challenge of a New Scientific Discipline"—W. C. Shaw, Weed Investigation Section, USDA. "The Role of the State Experiment Stations and Extension Services in Developing a Weed Control Program"—D. W. Colvard, North Carolina State College. "The Effects of Legislation and Regulations on Herbicide Research and Use"—L. S. Hitchner, exec. sec., National Agricultural Chemicals Assoc. "The Responsibilities of the Chemical Industry in the Development of a Weed Control Program"—J. W. Britton, Agricultural Chemicals Div., Dow Chemical Co.

January 18, Tuesday

"Weed Control in Agronomic Crops," J. K. Leasure, presiding. "Effect of CMU on Sugar Cane Yields"—A. J. Loustalot, T. J. Muzik, and H. J. Cruzado, USDA, Federal Experiment Station, Mayaguez, Puerto Rico. "Herbicidal Control of Weeds in Sugar Cane"—V. L. Guzman, Florida Agricultural Experiment Station, Belle Glade. "Can Dalapon be Used Safely on Field Corn"—G. M. Shear and W. E. Chappell, Virginia Agricultural Experiment Station, Blacksburg. "Weed Control in Corn Using Pre-Emergence Application of Several Monsanto Experimental Materials, Karmex D, Karmex M and 2,4-D"—G. C. Klingman. "Field Studies With One New Class of Herbicides"—L. H. Hannah, Monsanto Chemical Co., St. Louis.

"Weed Control in Cotton," R. P. Upchurch, presiding. "A Review of Progress in Weed Control in Cotton"—E. D. Witman, Columbia-Southern Chemical Corp., Pittsburg. "Control of Early Weeds in Cotton"—H. E. Rea, Texas Agricultural Experiment Station, College Station. "Comparison of CIPC Versus DNOSBP Versus a 1:1 Mixture of These Chemicals as a Pre-Emergence Treatment For Cotton."—D. E. Davis and S. V. Searcy, Alabama Agricultural Experiment Station, Auburn.

"Effects of Heavy Applications of Pre-Emergence Herbicides to Cotton in Relation to Seasonal Conditions"—W. B. Albert and W. A. Balk, South Carolina Agricultural Experiment Station, Clemson. "Compound 444, A New Pre-Emergence and Post-Emergence Herbicide for Cotton"—Joe Antognini and H. M. Day, Geigy Agricultural Chemicals, Bayonne, N. J. "The Effectiveness of Dalapon in Controlling Johnson Grass"—H. E. Rea, "Hexachloroacetone and Related Herbicides for Controlling Johnson Grass"—H. E. Rea.

"Control of Woody Plants," Robert A. Darrow, presiding. "Silvex, A Promising Brush Control Chemical For the South"—J. W. Gibson, Dow Chemical Co., Oklahoma City. "Aerial Applications of Herbicides for Control of Post and Blackjack Oaks" — Robert A. Darrow and Wayne G. McCully, Texas Agricultural Experiment Station, College Station.

January 19, Wednesday

"Weed Control in Agronomic Crops" —chairman to be announced. "The Influence of Volume of Spray Upon the Efficiency of DNBP and CIPC as Pre-Emergence Herbicides"—W. B. Ennis, Jr., Section of Weed Investigations, USDA, State College, Miss. "1954 Trials with Crag Herbicide 1 (SES) on Peanuts"—J. R. Wheatley, Carbide and Carbon Chemicals Co., New York, and W. W. Wells, Florida Agricultural Supply Co., Jacksonville.

"Progress Report on Use of Several Herbicides for Weed Control in Spinach" —C. G. McWhorter and W. W. Watson, section of Weed Investigations, USDA, Mississippi Agricultural Experiment Station, Stoneville. "A Summary of Weed Control Experiments in Sweet Corn on the Organic Soil of the Florida Everglades"—E. A. Wolf and V. L. Guzman, Florida Agricultural Experiment Station, Belle Glade.

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Potash Hearings Jan. 25th

The Tariff Commission will hold public hearings January 25 in the anti-dumping investigation of muriate of potash from the soviet zone of Germany. The hearings will be held at the commission's headquarters in Washington, D. C.

According to the tariff commission announcement the investigation is to determine whether the domestic potash industry is being injured by the imports, which are being sold here at less than fair value.

A case more recently referred to the Commission involves potash from West Germany and France.

•

Sohio Names Coleman

Henry J. Coleman has been appointed sales manager of the Standard Oil Co.'s (Ohio) newly organized petro-chemical dept. at Lima, Ohio, where a $17,000,000 petrochemical plant is being built. Mr. Coleman has been with Sohio since 1946 as staff assistant in marketing research, advertising manager, and chief of site development in the marketing department.

The plant at Lima, which is expected to be in operation by November, will be devoted primarily to the production of fertilizers, but a substantial percentage of its products will go to industrial users. It will have a daily capacity of 300 tons of anhydrous ammonia, of which 200 tons per day will be used in additional processing to make approximately 125 tons of urea. Other products of the plant will be nitric acid and nitrogen solutions.

Harry S. Knobel, who has been with Sohio since 1950 in marketing research, will take over as chief of site development in the marketing department.

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NEWS Brevities

CARBIDE AND CARBON CHEMICALS CO., a division of Union Carbide and Carbon Corp., New York, recently issued an eight-page technical bulletin describing ethylene carbonate and propylene carbonate. The two compounds are now commercially available as intermediates in the preparation of agricultural chemicals.

* * *

E. LIPSCOMB, director of the National Cotton Council, was recently named president of the Agricultural Relations Council for 1955. J. J. Lacey and L. A. Kern, were named as vice president and secretary-treasurer, respectively.

* * *

L. W. Melander

R. A. Fosse

AMERICAN CHEMICAL PAINT CO., Ambler, Pa., recently named L. W. Melander and R. A. Fosse to its research staff. (Story p. 75, Dec., 1954).

* * *

B. A. FRANKLE, Mor-Gro, Inc., Algona, Iowa, was elected president of the Great Plains Agricultural Ammonia Assoc. at a recent meeting.

* * *

H. E. KLEIN has been been appointed district manager of the Kansas City District of Carbide and Carbon Chemicals Co., a division of Union Carbide and Carbon Corp.

James R. Campbell was recently named manager of the Shreveport, La. sales office of Virginia Carolina Chemical Corp. (Story P. 78, Dec., 1954).

C. W. TURNER was recently advanced to manager of specialty sales at Diamond Alkali Co., Cleveland.

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CHEMICAL PROCESS & MACHINERY CORP. has purchased a sixty-ton per day ammonium sulfate plant from the Consolidated Edison Co., N. Y.

* * *

THE FERTILIZER MANUFACTURING Cooperative, Inc., Baltimore, recently installed equipment for the production of granular fertilizer, and will continue manufacture of mixed fertilizer.

* * *

HAROLD E. BINGHAM, director of traffic for Spencer Chemical Co., Kansas City, Mo., was elected secretary of the National Association of Shippers Advisory Boards at its 18th annual meeting in Louisville, Ky.

* * *

WALCOTT & STEELE, INC., Greenville, Miss., announced recently incorporation of the Delta Chemical and Fertilizer Co., Inc., which has facilities of an insecticide plant and fertilizer mixing plant.

* * *

FOOD MACHINERY & CHEMICAL CORP., San Jose, Calif., announces that on January 1, 1955, its subsidiary, Buffalo Electro-Chemical Co. will be merged with the parent corporation, and thereafter will operate as its Becco Chemical Division.

* * *

COMMERCIAL SOLVENTS CORP., New York, appointed to its industrial chemicals sales department, R. E. James and T. B. Gilday.

* * *

ARTHUR LINZ has resigned as vice president of Climax Molybdenum Co. to open his own offices as a technical consultant. He has been with Climax since 1936.

* * *

STAUFFER CHEMICAL CO. has added H. D. McGowan to its staff as assistant director of market development. Mr. McGowan was previously vice president and general manager of Algonquin Chemical Co.

* * *

MERRITT-CHAPMAN & SCOTT CORP. will acquire control of Tennessee Products & Chemical Corp. through an exchange of common stock. C. McFarlin, president of Tennessee Products, has announced that there will be no change in company policies or management.

* * *

MO-KAN FERTILIZER AND GAS CO., Inc., was organized recently at Wathena, Kansas. Incorporators are James Dale and R. E. Youngman, both of St. Joseph, Mo. and R. F. Glick of Wathena.

* * *

ROBERT J. NULPH recently joined Michigan Chemical Corp., St. Louis, Mich., as analytical research chemist.

* * *

SHELL CHEMICAL lowered prices of synthetic ammonium sulfate marketed on the west coast, and has placed its sale under fair trade regulations. The move was seen as an attempt to prevent underselling of listed prices.

* * *

THE CERTIFICATE OF MERIT of the Vegetable Grower's Assoc. of America was presented to Lyman G. Schermerhorn, vegetable research specialist at the Rutgers College of Agriculture, during the association's convention in Syracuse, N. Y., last month.

NORTHERN CHEMICAL INDUSTRIES, INC., Searsport, Me., will add to its present facilities a plant for the production of anhydrous ammonia to supply the New England area and Canada.

* * *

WESTVACO CHLOR-ALKALI DIV. of Food Machinery & Chemical Corp. recently announced that it will construct a sixty ton per day anhydrous ammonia plant at South Charleston, W. Va.

* * *

ARBORICULTURE SERVICE & SUPPLY CO., Denver, Col., has announced the appointment of Dr. W.D. Thomas, Jr. as director of technical research. Dr. Thomas was plant pathologist for the Colorado Agricultural Experiment Station.

* * *

ARKELL & SMITHS, Canajoharie, N. Y., has appointed W. H. Barrows New England district manager, with headquarters in Boston.

* * *

THE FINNISH GOVERNMENT proposes to double the output of the state nitrogen factory at Oulu in northern Finland. Present output is 16,000 tons of nitrogenous fertilizer per year. The extension is expected to cost 2,400 marks and will take two years to build.

* * *

INDIA plans four new fertilizer plants in the next seven years and has established a Fertilizer Production Committee to supervise plans.

* * *

NORTH QUEENSLAND Fertilizers & Chemicals, Ltd., Caerns, Australia, was to be in commercial production at the close of 1954.

* * *

INLAND CHEMICALS, Canada, Ltd., recently opened for public sale notes for financing a new sulfuric acid plant.

* * *

AUSTRALIA plans reclaiming of thousands of acres of semi-desert country by aerial application of superphosphate and traces of minerals.

* * *

FERTILIZERS AND CHEMICALS, Ltd., Haifa, have added a three unit plant for the manufacture of phosphoric acid, dicalcium phosphate and potassium sulphate.

* * *

GEORGE H. SERVISS, G. L. F. Soil Building Service, Ithaca, N. Y., has been elected 1955 chairman of the American Chemical Society's division of fertilizer and soil chemistry. Dr. G.L. Bridger, Iowa State College, has been named vice chairman and Dr. Stacy B. Randle, N. J. Agricultural Experiment station, Rutgers, was chosen secretary.

THE TARIFF COMMISSION has set February 8 as the date for public hearings on the second anti-dumping act case involving imports of muriate of potash into the United States from Western Europe.

* * *

HERCULES POWDER CO. recently appointed John K. Speicher manager of technical publications in the advertising department. Hercules has also announced the organization of an agricultural advertising division with Edwin H. Ginn as manager.

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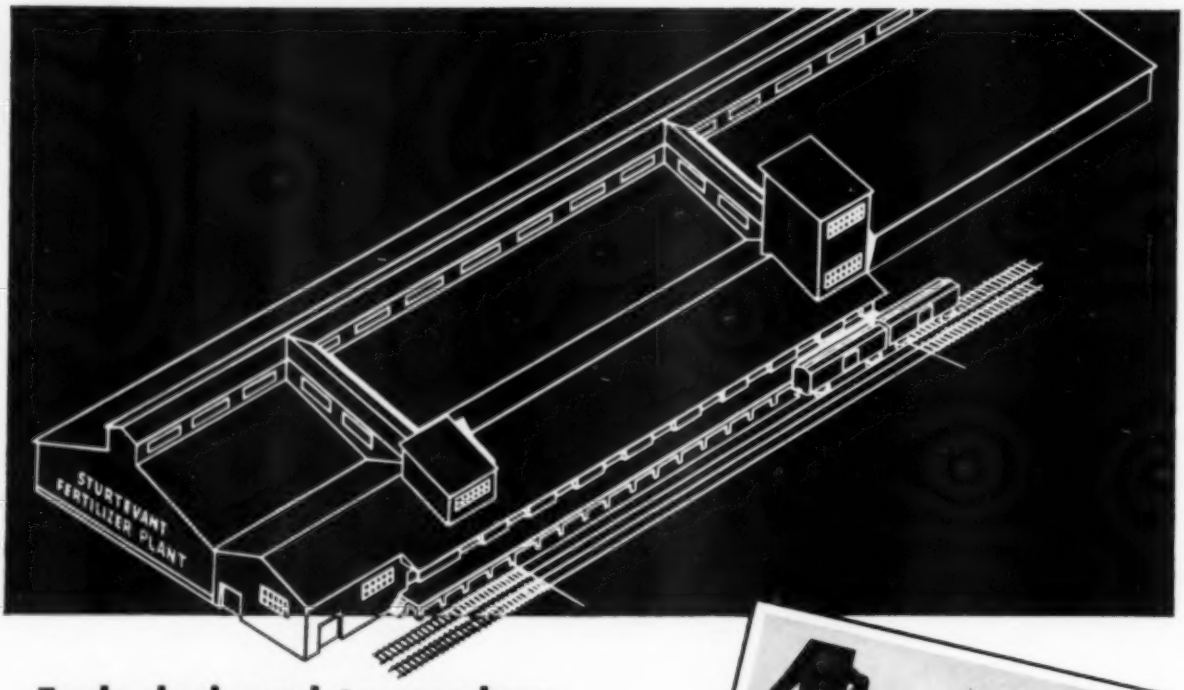

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INDUSTRY *Patents*

The information below is furnished by patent law offices of

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The data listed below is only a brief review of recently issued pertinent patents obtained by various U. S. Patent office registered attorneys for manufacturers and/or inventors. Complete copies may be obtained direct from Lancaster, Allwine & Rommell by sending 50c for each copy desired. $1.00 for Canada. They will be pleased to give you free preliminary patent advice.

2,690,389. LIME-TREATED DIATOMACEOUS EARTH AS A PARTING AGENT FOR AMMONIUM NITRATE. Patent issued Sept. 28, 1954 to Merton L. Studebaker, Bartlesville, Okla., assignor to Phillips Petroleum Company, a corporation of Delaware. A process of producing a coating for prilled NH_4NO_3 comprising boiling at substantially atmospheric pressure from 1 to 4 hours diatomaceous earth with an aqueous solution of lime in the proportion of one part of diatomaceous earth to from 0.25 to one part by weight lime, removing and washing the diatomaceous earth to remove excess lime, drying and adding said diatomaceous earth to NH_4NO_3 particles.

2,693,407. METHOD AND COMPOSITION FOR THE CONTROL OF UNDESIRABLE VEGETATION. Patent issued Nov. 2, 1954, to Arthur W. Swezey, Garden Grove, Cal., assignor to The Dow Chemical Co., Midland, Mich., a corporation of Delaware. A concentrate composition for the suppression of the growth of vegetation comprising as an active toxic ingredient a trichloroacetate of a chloroaryloxy alkanol, having the formula

$$CCl_3C(=O)—O—C_nH_{2n}—O—R$$

wherein n represents one of the integers 2 and 3 and R represents a chloroaryl radical, in admixture with at least one material selected from the group consisting of finely divided inert solids and surface active dispersing agents, the active ingredient being present in the amount of from 5 to 95 per cent by weight.

2,695,258. PEST CONTROL SMOKE GENERATORS. Patent issued Nov. 23, 1954, to Cecil Johnstone, Ardrossan, and Douglas J. B. Marke, West Kilbridge, Scot., assignors to Imperial Chemical Industries Ltd., a corporation of Great Britain. A pest control smoke generating composition comprising at least one vaporizable pest control compound, ammonium dichromate, and potassium persulphate, wherein the amount by weight of potassium persulphate to ammonium dichromate is between 2:3 and 3:2.

2,695,305. MERCURY COMPOUNDS OF PARA-AMINO SALICYCLIC ACID DERIVATIVES AND A PROCESS OF PREPARING THEM. Patent issued Nov. 23, 1954, to Gustav Ehrhart, Frankfurt am Main Hochst, Heinrich Ruschig, Frankfurt am Main Griesheim, and Heinrich Leditschke, Frankfurt am Main Hochst, Ger., assignors to Farbwerke Hoechst Aktiengesellschaft vormals Meister Lucius und Brun-

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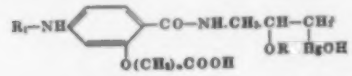
ing, Frankfurt am Main Hochst, Ger., a german company. Compounds of the general formula:



in which R stands for a member selected from the group consisting of hydrogen, a lower alkyl and lower hydroxyalkyl radicals, R_1 represents a lower aliphatic acylradical and n is a number from 1 to 3.

2,695,306. Process of Methylating Sodium Ortho Arsenite. Patent issued Nov. 23, 1954, to George E. Miller, Edgewood Arsenal, and Ebenezer E. Reid, Balto., Md. In a process for methylating sodium ortho arsenite with methyl chloride, the reaction being carried out in a closed system under pressure and at temperatures above normal, the step of maintaining the ratio of alkali to arsenious oxide equivalent to that stoichiometrically required for formation of sodium ortho arsenite.

2,695,734. Fertilizer Distributor. Patent issued Nov. 30, 1954, to Curtiss L. Cook and Austin E. Young, Syracuse, N. Y., assignors, by mesne assignments, to Deere & Co., Moline, Ill., a corporation of Illinois. 4. For use in a fertilizer distributor comprising a hopper including a generally rectangular hopper bottom having a slot extending transversely of the hopper bottom in laterally spaced relation, the wall of the hopper at the discharge end of said slot having an opening therein which is a continuation of said slot, and fertilizer discharge means movable generally horizontally underneath said slot for conveying fertilizer from the hopper outwardly through the associated hopper opening, the improvement comprising a discharge gate adapted to be mounted on the wall of the hopper having said opening, said gate having opposite edge portions, either of which is adapted to cover at least a portion of said opening, and means for reversibly mounting said gate on said hopper bottom.

2,695,839. Method and Compositions for Killing Weeds. Patent issued Nov. 30, 1954, to John W. Kenney, Jr., Long Beach, and Joseph W. Girard, Hermosa Beach, Cal., assignors to Great Lakes Carbon Corp., New York, a corporation of Delaware. A composition for killing growing weeds comprising essentially a calcined diatomaceous earth aggregate impregnated with herbicidal agent, said aggregate having a minimum particle size of about +30 mesh and being resistant to abrasion, crushing and to slacking when wet by water.

2,695,840. Methods and Compositions for Killing Weeds. Patent issued Nov. 30, 1954, to Paul W. Leppla, Palos Verdes, Cal., assignor to Great Lakes Carbon Corp., New York, a corporation of Delaware. A composition for killing growing weeds comprising essentially a substantially dry pumice aggregate impregnated with herbicidal agent, said aggregate having a particle size within the range of —¼ inch to +50 mesh and a water absorption factor, dry basis, of at least 25 per cent by weight, said aggregate being resistant to abrasion, crushing, and to slacking when wet by water.

2,695,841. Method of Treating Seed—Potatoes for Checking Premature Sprouting. Patent issued Nov. 30, 1954, to Martinus Johannes Koopmans, Boekesteijn,'s Graveland, Neth., assignor to Hartford National Bank and Trust Co., Hartford, Conn., as trustee. A method of checking premature sprouting of seed potatoes comprising dressing said seed potatoes with an anti-sprouting agent containing about 20 to 160 milligrams of 1,1,2,3,3,4,5,5-octachloro-pentene-1 for each kilogram of seed potatoes.

2,695,903. Method of Preparing 2-Methyliso-Nicotinic Acid. Patent issued Nov. 30, 1954, to Julius Diamond, Philadelphia, and William F. Bruce, Havertown, Pa., assignors, by mesne assignments, to American Home Products Corp., New York, a corporation of Delaware. The improved process of producing 2-methylisonicotinic acid which comprises heating 6-methylpyridine-2,4-dicarboxylic acid at a temperature in the neighborhood of 200° C. in a closed reaction zone while exhausting evolved carbon dioxide from the reaction zone at such a rate as to maintain the pressure over the reaction mixture at not over 5 mm. of mercury, continuing the heating for 2—3 hours, whereby substantially 1 mol of carbon dioxide is eliminated from the starting product, and collecting as a sublimate 2-methylisonicotinic acid.

New Trademarks

K-Pells, in bold capitals, for animal repellent composition to repel animals from shrubs and other vegetation. Filed Mar. 25, 1954, by Farm Equipment Co., Inc., Columbus, Ohio. Claims use since Feb. 5, 1954.

Green Pride, in white capitals on figure of clover, for garden and farm fertilizers. Filed Mar. 3, 1953, by Wilbur-Ellis Co., Seattle, Wash. Claims use since Feb. 18, 1953.

Luxigro, in outlined capitals and lower case letters, for fertilizers. Filed Nov. 17, 1953, by the County Chemical Co., Ltd., Birmingham, England. Claims use since Aug. 20, 1952.

Liquilizers, in capitals, for liquid agricultural chemicals for fertilizer. Filed Jan. 28, 1954, by the Liquilizer Corp., Indianapolis, Ind. Claims use since Sept. 22, 1953.

Schrock, in open capitals, slanted down from left to right, for fertilizer. Filed Sept. 17, 1953, by Schrock Bros., Co., Congerville, Ill. Claims use since June 1, 1945.

R-Pells, in bold capitals, for animal repellent composition to repel animals from shrubs and other vegetation. Filed Mar. 25, 1954, by Farm Equipment Co., Inc., Columbus, Ohio. Claims use since Feb. 5, 1954.

Nitro-Sul, in script capitals with shadows to the right, for fertilizers. Filed Sept. 21, 1953, by Kerley Chemical Corp., Imperial, Cal. Claims use since Nov. 1, 1952.

Trade-Tone, in script capitals and lower case letters with drawing of cloud and lightning, for chemical fertilizers containing soil conditioning elements. Filed May 4, 1953, by Destruxol Corp., Ltd., Pasadena, Cal. Claims use since on or about Oct. 15, 1951.

Protecto, in capitals, for mulches. Filed Mar. 16, 1954, by McKenzie Milling Co., Quincy, Mich. Claims use since Mar. 8, 1954.

Pv, in white capital and lower case letter enclosed in horizontal diamond background, for fertilizer. Filed Apr. 14, 1954, by F. H. Peavey & Co., Minneapolis, Minn. Claims use since Mar. 26, 1954.

Signature, in script capitals and lower case letters, for fertilizer. Filed Apr. 16, 1954, by E. Rauh & Sons Fertilizer Co., Indianapolis, Ind. Claims use since on or about Apr. 1, 1954.

Fam, in curved lower case letters outlined to suggest depth, for organic plant food and soil conditioner. Filed Apr. 20, 1954, by Altoona Farm Inc., Altoona, Pa. Claims use since about May 15, 1953.

Ana-Vita, in boldface capitals and lower case letters, for vitamin food supplement for animals. Filed Jan. 29, 1954, by Animal Industry Development Co., Sunland, Cal. Claims use since Aug., 1953.

Warfar-Mor, in bold capitals, for rodenticide containing warfarin sold in pellet form as a concentrate for mixture with bait. Filed May 17, 1954, by Hilltop Laboratories, Inc., Minneapolis, Minn. Claims use since May, 1951.

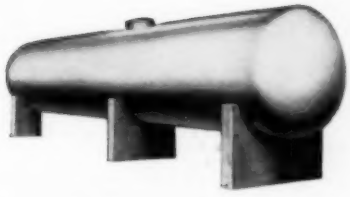
Peet's, in capitals decreasing in size from left to right, for protein supplement to be added to livestock and poultry feeds. Filed Jan. 12, 1954, by E. M. Peet Manufacturing Co., Council Bluffs, Ia., and Indianapolis, Ind. Claims use since Jan. 1946; and since on or about Oct. 1, 1946, as to "Peet."

MC, in boldface capitals for cotton defoliant. Filed Mar. 1, 1954, by Food Machinery and Chemical Corp., San Jose, Cal. Claims use since June 14, 1953.

Tom Cat, in capitals, for rodenticide. Filed Dec. 7, 1953, by General Insecticide Co., Inc., Utica, N.Y. Claims use since June 25, 1938.

22,000-gallon non-pressure bolted tank for bulk storage.

BUTLER offers 3 ways to profit from liquid nitrogen bonanza



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"METERED" SPREAD: Makes every pound of fertilizer count! Just check the Chart (see Figure 1 in photo above) for desired amount of fertilizer to be spread per acre; set the Gate (Figure 2); apply the volume you want. It's as simple as that! No waste . . . every field is accurately and scientifically spread.

HYDRAULIC DISTRIBUTION: As trouble-free as a spreader can be. No dust can get into sealed hydraulic system . . . eliminates gas engine, transmissions, gear reduction cases, or bearings. Governed Hydraulic Distributor (Figure 3) assures uniform width of spread, regardless of engine speed. The hydraulically-applied Ground Drive provides uniform flow of fertilizer to distributor, regardless of engine speed or gear.

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Phoenix, Guerin Impl. Co.
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Hanford, Walt Vigario
La Habra, I. J. Cool Co.
Oakland, Mill Eng. & Mach. Co.
Oakland, Monarch Truck Equip. Co.
Tulare, Jim Ingle Co.
Colorado
Denver, Timpte, Bros., Inc.
Connecticut
Hartford, Holmes-Talcott Co.
Delaware
Milford, B. V. Wharton
Georgia
Atlanta, Brooker Truck Equip. Co.
Illinois
East St. Louis, Trans. Equip. Co.
Hoopeston, Cox Brothers
Jerseyville, Baughman Serv. & Equip. Co.
Mason City, Baughman Serv. Co.
Moline, Moline Body Co.
Indiana
Evansville, Hallenberger, Inc.
Indianapolis, Allied Truck Equip. Corp.
Iowa
Boone, Baughman Mfg. Co., Iowa Sales Div.
Des Moines, Hawkeye Truck Equip. Co.
Mason City, Heimbuch Impl. Co.
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Washington, Loveless Impl. Co.
Kansas
Columbus, Paul Coons
Kentucky
Lexington, Wilson Mach. & Sply Co.
Owensboro, Wilson Mach. & Sply. Co.
Louisiana
New Orleans, Truck Equip. Co.
Massachusetts
Cambridge, Sandberg Equip. Co.
Michigan
Lansing, Truck & Trailer Equip. Sales Co.
Rockford, Burch Body Works
Saginaw, Scientific Brake & Equip. Co.
St. Joseph, Terminal Materials Corp.
Minnesota
Duluth, Road Mach. & Supplies
Minneapolis, Ruffridge-Johnson Equip. Co.
Mississippi
Jackson, Cook and Co.
Missouri
Chillicothe, Cooke Sales & Serv., Inc.
Columbia, Columbia Machine Shop
Hannibal, Riegel Tire & Imp. Co.
St. Louis, Sleeper Equip. Corp.
Sedalia, M. J. Ressel & Sons
Montana
Billings, Industrial Equip. Co.
Great Falls, Normont Equip Co.
Kalispell, Treasure State Equip. Co.
Nebraska
Lincoln, Highway Equip. & Supply Co.
New Jersey
Newark, Tyler-Preusser Mach. Corp.
New Mexico
Anthony, Southwest Fertilizer & Chem. Co.
New York
Buffalo, T. E. Potts Equip. Co.
Groton, Highway Materials Co., Inc.
Pelham Manor, Tyler-Preusser, Inc.
Rensselaer, Van's Equip. Sales, Inc.
North Carolina
Charlotte, Twin-States Equip. Co.
Raleigh, Twin-States Equip. Co.
Ohio
Canfield, Myers Equip. Corp.
Cleveland, Ohio Truck Equip. Co.
Columbus, Harry J. Reynolds and Assoc.
Toledo, Riedy-Manner Truck Equip. Corp.
Oklahoma
Tulsa, Tulsa Machinery Co.
Oregon
Amity, Burlingham-Meeler Lime Co.
Pennsylvania
Camp Hill, L. B. Smith
Erie, Farm Equip. Co.
Marion Center, Betty Bros.
South Dakota
Sioux Falls, Roy F. Drake Body & Equip. Co.
Tennessee
Knoxville, Brooks Equip. & Mfg. Co.
Memphis, Scruggs Equip. Co.
Nashville, Industrial Tractor & Equip. Co.
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El Paso, Equipment Supply Co., Inc.
Ft Paso, Hobbs Trailer Sales Co., Inc.
Fort Worth, Hobbs Mfg. Co.
Houston, Mathieson Chem. Co.
Houston, South Texas Truck Equip. Co.
Sulphur Spring, Longhorn Brokerage Co.
Utah
Salt Lake City, Lund Mach. Co.
Virginia
Richmond, Smith-Moore Body Co.
Roanoke, Growers & Producers Exch. Inc.
Winchester, Shade Equip. Co.
Wisconsin
Eau Claire, Olsen Equip. Co.
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Suppliers' BULLETINS

Bulletin on Bayer 17147

A bulletin describing the properties of Bayer 17147, a development of Farbenfabriken Bayer A.G., Germany, was issued recently by R. J. Geary, Blue Point, N. Y. The compound is reported to be effective against pink boll worm, boll worm, boll weevil, cotton leaf worm, cotton aphid, cotton mites, cotton stainer, thrips, brown cotton leafworm, and cotton fleahopper. The product is a crystalline solid melting in the range of technical DDT.

•

New Du Pont Garden Products

A new chemical combination that can be sprayed or dusted on roses and most other flowers or ornamentals to control insects and fungous diseases will be available for rose growers and gardeners for the 1955 gardening season, according to a release by E. I. du Pont de Nemours & Co., Wilmington.

The new material, Du Pont Rose Insecticide and Fungicide, contains a combination of three insecticides in a low toxicity mixture, plus the Massey formula of sulfur and "Fermate" ferbam fungicide. The insecticides include methoxychlor which gives residual control of most common insects, lindane for aphid control and quick insect knock-down, and "Aramite" miticide for specific control of red spider mites.

•

Ford Almanac Published

A new book on the most recent developments in agriculture, "The Ford 1955 Farm, Ranch, Home Almanac" has just been published by Simon and Schuster, Inc., New York. Results of the latest scientific research on weather, fertilizing, recent USDA recommendations on insecticides, together with new developments in modern farm machinery are detailed in the book. The "Cropmeter," a new planting aid which divides the growing season into "growth units" rather than days is described.

•

Bulletin on Cherry Leaf Spot

Effective control of cherry leaf spot with Crag Fruit Fungicide 341, (a glyodin solution) is the subject of a new six-page pamphlet released by Carbide and Carbon Chemicals Co., a Division of Union Carbide and Carbon Corp., New York. The pamphlet discusses easy methods of applying Crag glyodin solution and lists suggested spray schedules, compatibility data, and the costs of using this organic fungicide.

•

F & B Announces Leaflet

A new leaflet describing four products from its line of garden and home agricultural chemicals has been published by Faesy & Besthoff, Inc., New York. The products are: "F & B Weed Killer," an all-purpose and non-selective sodium arsenite solution; "F & B Chlordane 5% Dust," for garden, lawn and home use; and "F & B Tobacco Dust."

•

Pamphlet on Pear Blight

Control of the blight of pears, apples and quinces with the use of zineb and the antibiotics streptomycin and terramycin is discussed in a newly released leaflet. Instructions for using antibiotics against this bacterial disease are given; however, it is reported that the removal of hold-over blight by cutting off the dead twigs and cutting out cankers is still the most important control measure. John C. Dunegan, USDA Department Leaflet No. 187.

Carbide Chemicals Booklet

Carbide and Carbon Chemicals Co., Division of Union Carbide and Carbon Corp. recently issued the 1955 edition of the booklet, "Physical Properties of Synthetic Organic Chemicals". In 24 pages, this edition presents the latest data on more than 350 organic chemicals and features 46 new products available from the Company.

•

Process Patents Abstracted

Over 1350 government-owned inventions applicable to chemical products and processes industries are described in an 101-page book released last week. Included are comprehensive sections on insecticides, fungicides and rodenticides, and fertilizers.

•

Bulletin on Molybdenum

A new technical bulletin issued recently by Climax Molybdenum Co., New York, lists the thermodynamic values for molybdenum and its more important compounds. The 8-page booklet lists some 12 products.

•

Stainless Tubing Cuts Cost

Stainless steel tubing was installed recently at the Sullivan, Ill. plant of the Aylward Fertilizer Co. A company spokesman announces that the switchover from plastic tubing has already produced a 300% saving in material costs. While plastic broke down after two weeks of use, the steel installation is expected to last ten years.

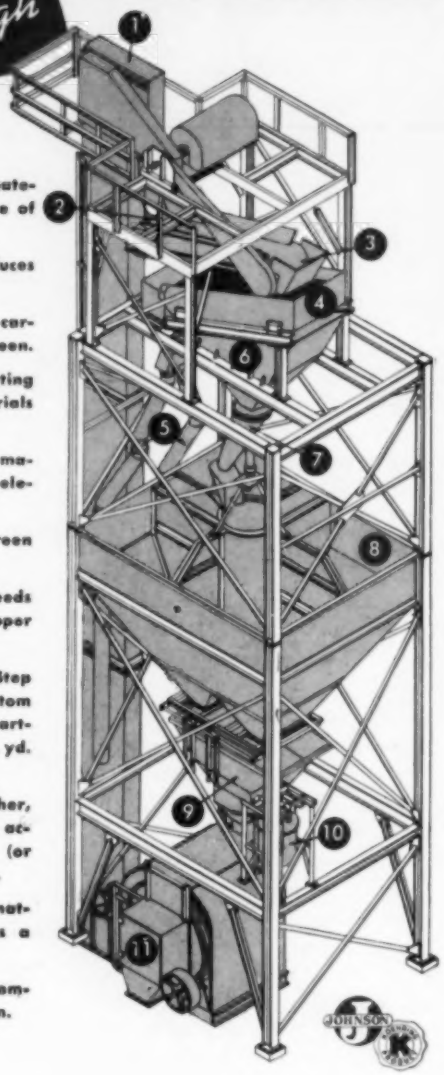
•

New Form of Panogen

A new form of Panogen is being marketed for use in slurry seed treaters. In the past, Panogen has been sold to seedsmen and other users only for use in special equipment supplied by Panogen, Inc. The company has announced that since a large number of seed processing men already have good slurry treaters it could better serve the trade by producing a formulation especially for use in slurry machines. This is called Panogen 42. It is a concentrated liquid which must be diluted before using. Otherwise, it is identical with the regular ready-to-use.

take a 1-minute "tour" through

JOHNSON BLENDING PLANT



1. Chain bucket elevator feeds material into the plant at the rate of 1000 cu. ft. per hour.
2. High-speed clod breaker reduces materials to required size.
3. Self-cleaning belt conveyor carries pulverized material to screen.
4. Vibrating, 4x10-foot separating screen controls size of materials fed into collecting hopper.
5. Reject pipes return oversize material from screen to bucket elevator for re-sizing.
6. Collecting hopper under screen charges pivoted distributor.
7. Full-revolving distributor feeds screened material from hopper into sectional storage bin.
8. Johnson 65 cu. yd. Step-by-Step Bin, with fast-flowing 60° bottom slopes, has four 15-yd. compartments arranged around a 5 cu. yd. central tank.
9. Multiple-material weigh batcher, with 5,000-lb. dial-head scale, accurately weighs up to five (or more) fine-grained materials.
10. For adding liquids, semi-automatic solution weigh-batcher has a capacity of 500 lbs.
11. Mixing unit (2-ton capacity) completes final blending operation.

Eliminating slow, costly manual methods, Johnson fertilizer plants elevate, pulverize, screen, batch, and blend materials in one continuous cycle of operation. Owners report substantial increases in production and savings in manpower. Installation shown here is one of two Johnson plants developed to meet the special needs of a large midwestern fertilizer manufacturer. It is typical of the many sizes and types of Johnson plants available for mixing and blending all types of materials . . . manually-operated or fully automatic. You can get many profitable ideas on plants and accessories from Johnson distributor . . . or write us.

J349

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Also interested in: ☐ bulk phosphate storage plants ☐ aeration systems ☐ screw conveyors ☐ bucket elevators ☐ bins ☐ hoppers ☐ batchers ☐ clamshell buckets

E.S.A. MEETING REPORT

(*From Page* 44)

he indicated confidence in the eventual success of this development work. However, there are definitely many problems still to be worked out.

The primary consideration, of course, is that any systemic insecticide for use on livestock must be safe. Before any such product can be recommended for general use, it is thus necessary to study its effect on each species of farm animal. To be recommended, a compound should preferably be safe for as many species as possible and be effective at about the same dosage for each species in order to avoid the inevitable accidents that occur through failure to observe directions in application. Dr. Radeleff suggested a ten-to-one margin of safety as necessary to protect the occasional supersusceptible animal whose identity is not known in advance.

If an insecticide product tends to build up in the fat or other tissues this would constitute a hazard which would preclude its use. If this were not the case, Dr. Radeleff indicated, dieldrin, aldrin and lindane would probably already be marketed as injectable products. There is no question about their effectiveness against a large group of parasites as determined in the test work at Kerrville, but all three leave residues of sufficient size and sufficient permanence to preclude their use. Lindane, he indicated, because of its more rapid elimination might be used for limited veterinary applications, but only when the animals would not be offered for sale for several months after treatment.

Any systemic insecticides which might find their way into the milk could not be recommended for use on dairy animals, and since it is, in normal practice, difficult to limit the use of any compound to a specific group of animals, it would not really be safe to offer such a product for use even on beef cattle.

Despite all the numerous problems in connection with this new field for systemics, Dr. Radeleff expressed the opinion that eventually

all of the answers will be worked out so that systemics may be employed effectively and safely.

Research on Phosphates Reported

DR. Rosmarie von Rumker, Director of Research of Chemagro Corporation, New York, discussed recent developments in organic phosphate research. Reviewing the mode of action of organic phosphates, she noted that it was recognized as early as 1940 that certain organic phosphates inhibit enzymes of the cholinesterase group. It is generally assumed today, she added, that organic phosphates are hydrolyzed by cholinesterase in the same manner as acetycholine, in other words, that they competitively occupy the same sites in the enzyme at which the acetycholine hydrolysis normally takes place. The phosphate-enzyme complex which is formed is quite stable, thus making the enzyme unavailable for its natural function and resulting in the various symptoms normally associated with organic phosphate intoxication in experimental animals.

Organic phosphates are also capable of interacting with other esterases occurring in biological systems.

It has been suggested by others that organic phosphates must have a second mechanism of action different from cholinesterase inhibition, because some of the phosphates exhibit ovicidal properties. While the underlying principle of action of the organic phosphates is probably enzyme inhibition, this of course does not preclude that other effects or modes of action may be present, though none have been conclusively proved to exist as yet.

Dr. von Rumker reported that important developments are under way in the field of non-systemic organic phosphates. Several relatively or practically non-toxic organic phosphate insecticides have been developed, she observed, disproving the idea that high mammalian toxicity is inherent in the entire organic phosphate group. Among these new materials is Dipterex (Bayer L 13/59), which she described as an effective fly control agent with a very rapid knockdown action. It also shows promise in the agricultural field as it controls certain chewing insects, making it a valuable supplement to pesticides with special effectiveness against aphids and mites.

Dr. von Rumker predicted further interesting developments in the field of organic phosphates in the near future, as there are a number of new and interesting products of this class soon to emerge from current screening and testing studies.

Report on Systemic Residues

STUDIES on systox residues were reported on by T. R. Fujuto and R. L. Metcalf. Dr. Metcalf pointed out that at the usual rates of application for mite and aphid control, systox residues are essentially inconsequential when the material is applied as long as 21 days before harvesting. The systox residues break down rapidly in the plant, and within a short time there is no trace of the starting compound, which metabolizes rapidly.

Granular Pesticides Effective in Control of Corn Borer

TWO years of experimental work in granular insecticides for corn borer control were termed highly successful in a paper presented by H. C. Cox, T. A. Brindley and W. G. Lovely of Iowa State College, Ames, Iowa. The granular insecticides proved to be particularly effective against first brood corn borers, since the particles roll into the whorls of the corn stalks where they provide superior protection. Applications of granular type pesticides were also effective against second brood borers, as the granules tend to drop into and remain in the leaf axils of the plant, where borers commonly become established. Superior control was reported from applications of granular pesticides, as compared to sprays or dusts.

A second advantage from the use of the granular type material is that residues on the corn stalks are much lower.

Applications were made using a modified grain drill, mounted on high clearance equipment.

An improved method for treating seed corn with insecticides was reported by two other Iowa State College entomologists, J. H. Lilly and K. J. Starks. The chief problem in treating seed corn, they advised, is to get good application without harming the seed. They developed a method of applying lindane powder to the seed by use of a cellulose sticker, which proved superior to other methods of application, yet resulted in less injury to the plants. Cost of the treatment is small,—about 15 cents per acre, and commercial use of the treatment has now beeen started by several commercial seed companies.

In another paper Lilly and Starks described their work with insecticide treatments of soybean seeds. Both heptachlor and lindane gave good control of seed corn maggots, they reported.

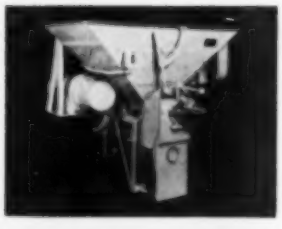
Spray Programs Grow in Complexity

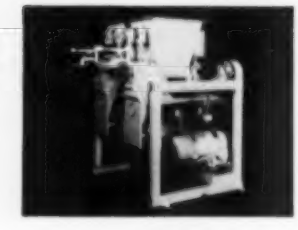
C. R. Cutright of the Ohio Agricultural Experiment Station, Wooster, Ohio, commented on the increasing complexities in the apple spray program in a paper in which he pointed out that is no longer possible to offer state-wide spray schedule recommmendations. He listed the following summary of the various factors which are responsible for the growing complexity in any type of insect or mite control program on fruit: new spray chemicals; new formulations; price differentation; new machinery for spray and dust application; new methods of chemical treatment; different recommendations; timing of spray applications; introduction of new pests; increased difficulty in controlling old pests; and the growth of the problem of resistant species of pests.

Dealing particularly with this final problem he observed that in Ohio growing resistance has been noted to control of mites with parathion and related compounds. As an example of the extent of such resistance he reported that in an orchard in southwestern Ohio ten consecutive applications of parathion (15% wettable powder at 1½ lbs. per 100 gallons) failed absolutely to control the European red mite.

A second such problem currently being faced in a number of areas is

5 LOW COST STOKER MODELS
designed for Dust-Free Packing of
AGRICULTURAL CHEMICALS





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Each model can adjust to handle different bag sizes with accurate weights—*within ounces*. Standard models are equipped to pack valve type bags, but attachments are available for open mouth bags and drums. Stoker Packers can be made portable by simple caster attachment. They come fully equipped with all motors, drives, and controls. All you do is connect the Packer to your power source.

FOR FIELD STRENGTH OR TECHNICAL GRADE CHEMICALS

All models are used for insecticides such as DDT, Chlordane, BHC, Toxaphene, Nicotine, and Sulphur, and for most commercial fertilizers. Please check with factory on specific formulae. Write for bulletins on Stoker Bag Packers and accessories to H. L. Stoker Co., 111 S. College Ave., Claremont, California.

STOKER *Bag Packers*

the failure of DDT and lead arsenate to control codling moth on apples. In one orchard near Cincinnati, where DDT had previously been effective, it failed completely to give control in 1954, with worm counts as high as 94.6 per 100 apples being reported following eight applications of DDT (50 WP 2 lbs.)

Mr. Cutright suggested that for the present the only remedy available is to offer a flexible schedule, presenting numerous alternate choices of materials and methods of application. He suggested specifically that use of any single miticide be strictly limited.

Successful experiments with band placement of insecticides for the control of clover root borer were reported upon by C. R. Weaver, also of the Ohio Station. Field trials of the method, in which insecticide is put down in the fertilizer band, gave very encouraging results in two seasons at the Wooster Station. Both BHC and aldrin were used, and both worked well. A particular advantage of the method is that, when band placement is employed, it is possible to cut in half the amount of insecticide used.

Tests with combination dusts for control of both insect pests and diseases on outdoor roses were reported in a paper by Floyd F. Smith, Edgar A. Taylor and W. D. McClellan of the Entomology Research and Horticultural Crops Research Branches, USDA, Beltsville, Md. Of thirty combinations tested, Aramite proved to be the best miticide, and copper and sulfur the best fungicide. In cases where black spot infection was controlled effectively by the fungicide used, aramite, malathion and ovotran all gave adequate control of spider mites, resulting in increased growth and flower production. Neither DDT, lindane or malathion gave adequate control of flower thrips and Japanese beetles, however.

New Cotton Pesticides

DR. E. E. Ivy of the Entomology Research Branch, Agricultural Research Service, U. S. D. A. described a new compound which kills cotton insects by systemic action. He

called TM 3911 "an extremely promising new systemic insecticide." When applied as a spray in the conventional manner, TM 3911 proved to be effective against the boll weevil by contact insecticidal action. A dosage of two pounds of the technical material per acre gave satisfactory weevil control in spray test work. In tests designed to determine the top dosage at which the product could be applied to seed without injury, it was found that no reduction in germination or loss in stand resulted from application of as much as 32 pounds of TM 3911 per 100 pounds of seed. No injury of any kind was apparent in the case of seed treated at rates of 8 lbs. or 4 lbs. per 100 lbs. of seed, although small necrotic lesions appeared on leaves of plants grown from seed treated at the rates of 16 and 32 lbs. per 100 lbs. of seed.

As compared with other systemics tested previously (TM 12008, TM 12009 and TM 12013) the systemic insecticidal action of TM 3911 was found to persist longer than with the other three compounds. This was particularly true in the case of boll weevil, thrips and cotton leaf perforators. TM 3911 gave control of aphids and spider mites for as long as two weeks or more at a dosage of ¼ lb. per acre.

Dr. E. E. Ivy also, reported on "Two New Phosphate Insecticides for Cotton Insect Control". One of these, a benzotriazine derivative of a dithiophosphoric acid, ethyl ester, a product of Farbenfabriken Bayer A. G. of Leverkuysen, Germany, designated as #16259, was described by Dr. Ivy as the most promising new compound for the control of the boll weevil studied during 1953. The methyl homolog of compound 16259, designated as compound 17147, was also tested. Compound 17147 is described as a benzotriazine derivative of a dithiophosphoric acid, methyl ester.

Compound 17147 proved to be promising in laboratory tests against the boll weevil, cotton aphid, spider mite, boll worm, cotton leaf worm, brown cotton leaf worm, flower thrips, cotton fleahopper, and pink boll worm. The compound was effective against both pink boll worm adults and larvae and in a late season field plot test, gave much better control of pink boll worm than did DDT.

Compound 16259 on the basis of laboratory tests proved more effective than compound 17147 against the salt marsh caterpillar, cotton aphid, and spider mite, but was less effective than compound 17147 against the boll weevil.

Khapra Beetle Threat

DISCUSSING "The Khapra Beetle Threat", a paper by Richard T. Cotton of the Biological Sciences Branch, U. S. D. A., Washington, D. C. was read in his absence by Dr. Henderson. The Khapra Beetle, the worst pest of stored grain in India, was first noted in the United States in 1953, first being noted in stored grain in Southern California.

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By the late summer of 1954, infestations were present in seven counties in California, five in Arizona and two in New Mexico. The Khapra Beetle is a particularly dangerous pest because it attacks a wide variety of products and is extremely difficult to control. The larvae, it was pointed out, are resistant to many residual insecticides. Further, they crowd into spaces in the structure of buildings where grain is stored, often being practically inaccessible. It is difficult to reach them in toxic concentration with the sprays and dusts employed.

In recent experimental work in the United States, practically no kill was obtained when larvae were exposed two hours to a surface depth of 1000 micrograms per sq. cm. of DDT, malathion, lindane, aldrin, dieldrin, parathion, chlordane, methoxychlor, DDT or allethrin. Fumigation with methyl bromide was effective, but the larvae show resistance to HCN. More work is necessary, Mr. Cotton said, to determine the effectiveness of residual sprays and dosages of methyl bromide needed to kill.

In the discussion which followed, it was pointed out that consideration is now being given to establishment of a quarantine area to contain this infestation of Khapra Beetle.

Report on Pink Bollworm

DISCUSSING "The Pink Bollworm Menace," Dr. F. C. Bishopp, coordinator of research at the Oscar Johnston Cotton Foundation, Brownsville, Texas noted that, on the basis of statistics gathered by the Bureau of Agricultural Economics, the estimated reduction in the cotton crop because of damage by insects ranges from 6.7 to 26.9% annually. Expressed in other terms, the insects take every seventh bale. And losses of this magnitude, he reminded, were the general rule even before the pink bollworm became an important loss factor, as it did for the first time in the U. S. in 1952, causing a loss estimated at 29 million dollars in South Texas.

The pink bollworm, he reminded, is an important pest of cotton in almost every country in the world. Its rapid spread during the past few years has emphasized the urgent need for more effective control measures. These it is hoped will eventually result from the cooperative program of research which has been initiated at the Brownsville, Texas research headquarters headed by Dr. Bishopp.

Control of Cotton Pests

RESULTS with use of a series of insecticides and combinations of various insecticides on the control of the leafroller on cotton in Imperial Country, California were reported in a paper by E. L. Atkins, Jr., H. T. Reynolds, M. H. Frost, Jr. and A. S. Deal, of the Citrus Experiment Station, Riverside, Calif. These investigators reported that DDT, parathion, methyl parathion, and Perthane proved effective in controlling this particular pest. They suggested that where heavy infestations are encountered, practical control involves a spray or dust program using three applications at weekly intervals.

Comparative field tests of toxaphene, chlordane, and strobane against the lone star tick on cattle were reported in a paper by H. M. Brundrett, Rowland Richards and C. L. Smith, Entomology Research Branch, Kerrville, Texas. Emulsion concentrates were sprayed at 0.5 percent concentration. All ticks were killed within 48 hours after treatment and the residual protection afforded by all treatments lasted from 14 to 18 days.

A new bioassay method for evaluation of insecticide residues was reported in a paper by Albert Hartzell and H. P. Burchfield, Boyce Thompson Institute, Yonkers, N. Y. The new technique is based on the ability of organic insecticides to inhibit the response of mosquito larvae to light. With the method, residues of 0.1 to 0.005 p.p.m. can be detected in a few hours in extracts from potatoes, yams, onions, etc, which have been treated with chlordane and heptachlor in field experiments.

"Selective Pesticides as an Aid to Biological Control in Apple Spray Programs" was the subject of D. W. Clancy, Entomology Research Branch, Kearneyville, W. Va., who reported

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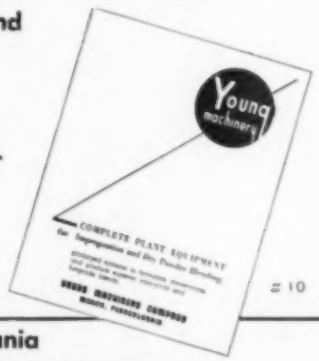

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that in orchard tests in West Virginia during the past three seasons, ryania insecticides have given outstanding control of codling moth comparable to that obtained with DDT. Ryania has the additional advantage that it is non-toxic to predaceous mites which help to keep down populations of phytophagous mites on unsprayed apple trees.

Experimental work in the development of respiratory protective devices for use when applying agricultural chemicals was reported in a paper by R. A. Fulton, Floyd F. Smith and R. P. Gelardo, U.S.D.A., Beltsville, Md. Respirator cartridges and gas mask canisters have been developed which are effective in removing mists, dusts and vapors of most of the commonly used insecticides. For use with organic phosphates the cartridges and canisters depend on fine pore filters having low air resistance to weathering. Chlorinated insecticides were found to require the use of activated charcoal.

Results with use of a new insecticide, cyclethrin, a pyrethrins-type synthetic, in livestock sprays for control of flies were discussed in a paper by Philip Granett, Rutgers University, and Harry L. Hayes, Boyce Thompson Institute. In general, it was found that about one and one-half to two times as much cyclethrin is needed as pyrethrins to provide from one to four days protection.

H. T. Reynolds, University of California, Riverside, Calif., reported on control of a leafhopper, *Empoasco solana* on cotton in Southern California. DDT gave only erratic control, but of other materials tested, perthane and several phosphate insecticides gave satisfactory reductions in leafhopper populations. Mr. Reynolds also reported on control of the cotton bollworm, *Heliothis armigera* on Southern California cotton. In these tests, toxaphene-DDT combinations appeared to be slightly superior to DDT alone and to endrin.

Results of preliminary tests and field trials with some of the newer chlorinated hydrocarbon and a number of organic phosphorus insecticides for louse control on livestock and poultry were reported in a paper by Charles L. Smith and Rowland Richards, Entomology Research Branch, Kerrville, Texas. Some of the products tested were found to be effective in controlling lice on cattle, goats, and poultry. In general, the phosphorus compounds did not exhibit the residual qualities of the chlorinated hydrocarbon insecticides, but they were effective at much lower concentrations.

Nevin Weaver, Texas Agr. Exp. Station, and C. F. Garner, Texas Agi. Ext. Service, College Station, Texas, reported on their work in the control of insects on hairy vetch. Demeton at one eighth pound per acre gave good control of pea aphids on hairy vetch for three weeks, and fair control for four weeks. When applied at the rate of one quarter pound per acre, good control was obtained for four weeks, and fair control for five weeks. Toxaphene at two pounds per acre in combination with demeton, applied immediately before bloom, gave adequate seasonal control of lygus bugs.★★

LABEL PRECAUTIONS

(*From Page 83*)

and 150°F., the caution "Do not use or store near heat or open flame" is acceptable.

Below are the new listings for which specific precautionary label information has been added in the revised interpretation:

Aldrin, ammonium sulfamate, captan, chlordane, chloro-IPC, p-chlorophenyl dimethylurea, p-chlorophenyl-p-chlorobenzene sulfonate, p-chlorophenyl phenyl sulfone, citronella, dichlorophenyl dimethylurea, 2,4-dichlorophenyl ester of benzene sulfonic acid, di-(p-chlorophenyl) methyl carbinol, dieldrin, O,O-dimethyl-O,p-nitrophenyl thiophosphate, di-n-propyl maleate isosafrole condensate (n-propyl isome), endrin, O-(2-[ethylmercapto] ethyl) O,O-diethyl thiophosphate, heptachlor, hexaethyl tetraphospate, lime-sulfur solutions, lindane, malathion, maleic hydrazide, maneb, methoxychlor, methyl chloride, 2-methyl,4-chlorophenoxyacetic acid,

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NEWS FROM NAUGATUCK

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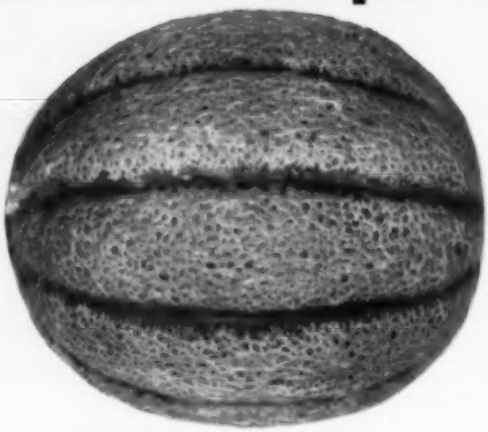

Extensive field use proves that Naugatuck's new herbicide, Alanap-1, can save growers of cucumbers, melons and squash countless dollars by practically eliminating hand weeding.

One experiment revealed that cucurbit yields were actually doubled by a pre-emergence application of Alanap-1. "Plants in untreated rows were severely stunted by weed competition before the fields could be cultivated and hoed, whereas treated rows were still not suffering...two months after planting."

As a pre- or post-emergence weed killer, Alanap-1 gives excellent control of a variety of annual weeds, is non-hazardous to humans, animals, easy to apply, low in cost, and safe on recommended crops which now include asparagus.

Naugatuck Chemical

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WHAT CROP?_____

Weeds to control?_____

Acreage_____

NAME_____

ADDRESS_____ CITY_____ STATE_____

N-1 naphthyl phthalamic acid, 2-nitro-1,1-bis(p-chlorophenyl) butane and/or 2-nitro-1,1-bis(p-chlorophenyl) propane, octyl-bicyclo-heptene-dicarboximide, N-octylsulfoxide of isosafrole, peracetic acid, phenylmercuric acetate, piperonyl cyclonene, 2-pivalyl-1,3-indandione, rotenone, sesamin, sodium isopropyl zanthate, sodium trichloroacetate, sulfur, 2-(p-tertiary-butyl phenoxy)-isopropyl-2-chloroethyl sulfite, tetraethyl dithionopyrophosphate, trichloroacetic acid, and warfarin.

•

Indo-China Gets Fert. Funds

An allotment of $200,000 to Indo-China for the purchase of nitrogenous fertilizers was announced last month by the Foreign Operations Administration. The period for delivery extends through Sept. 30, 1955.

FERTILIZER REPORT

(*From Page* 41)

tons (10.6 per cent) and in K_2O 74,000 tons (4.3 per cent), but the consumption of P_2O_5 decreased 44,000 tons (2 per cent). The amounts and proportions of the nutrients consumed in mixed fertilizers were 798,000 tons (44 per cent) for nitrogen, 1,789,000 tons (80 per cent) for P_2O_5, and 1,609,000 tons (89 per cent) for K_2O. Materials for direct use accounted for 103,000 tons of the increase in nitrogen. Although mixtures supply 7,000 tons more P_2O_5 than in 1952-53 the use of this nutrient in direct-application materials decreased 51,000 tons. The use of K_2O increased 55,000 tons in mixtures and 19,000 tons in materials for direct application. In most regions east of the Mississippi, there was a decrease in the use of P_2O_5 both in mixtures and as material for direct application.

The weighted average plant nutrient content of mixtures is shown in Table 2. The national average increased from 25.85 per cent in 1952-53 to 26.8 per cent in 1953-54. This average, in 1953-54, comprised, nitrogen 5.1, P_2O_5 11.4, and K_2O 10.3 per cent. The values for these nutrients in 1952-53 were 4.63, 11.34, and 9.88 per cent, respectively.★★

WASHINGTON REPORT

(*Continued from Page 63*)

The whole stored-grain problem is becoming more difficult to manage. The administrative problems are tremendous, including financing, providing the physical storage, inspections and sanitation.

You can get a good perspective of the size of the problem from these figures—the on-farm storage capacity of this country is about 2-½ billion bushels; commercial storage is estimated at about the same. The third storage owner, which is the Government, has about 8 million bushels of space, bringing the total to 5.8 billion bushels. Look at it this way—if you filled all this space with wheat, it would take every kernel we produce in the United States for five full years!

* * * * * *

New target date for opening of the residue Laboratory at the Coastal Plains Research Station, Tifton, Georgia, is late March or April. This cooperative Federal-State work is aimed at collecting more data on residues on pasture and forage crops, heralding a residue study in meat and all livestock products.

* * * * * *

There was considerable enthusiasm at the recent Cotton Insect Conference in Dallas about the results from use of systemic insecticides on seed. It appears that good protection is afforded the young cotton plant not only during germination, but for several weeks thereafter. This is one other way to get away from the "cyclic" nature of the business.

More testing is being launched to study the effect of systemics on germination. Here is a field which can be a sizable and important market.

REVIEW OF 1954

(*Continued from Page 62*)

of stored grain were reported from California. These were identified as *Lophocateres pusillus* and *Palorus ratzburgi*. A dermestid *(Attagenus alfierii)* was found during August in several locations in Arizona. This represents a new record for the Western Hemisphere. As far as known the species is not of economic importance. Lesser grain borer was collected in Idaho for the first time, being collected in a feed mill in Plymouth.★★

GRAIN FUMIGATION

(*Continued from Page 56*)

sampling tube was placed just above the load; one starboard aft; and one on the fore wall of the tween deck hold.

In hold #5, ship B, which contained 40,583 bushels with an average depth of 20 feet, 21 probes were also installed as in holds #4 and #5, ship A. In addition, one sampling tube was placed above the load; a second on the port wall center of the tween deck hold; and another in the escape hatch.

In each test the escape hatch was sealed off above the fan and the air discharge diverted back into the tween deck hold through a side door in the escape hatch. This established a recirculation system with the air passing through the fan into the tween deck hold, and thence through the open hatchway into the lower hold where it was drawn through the grain again. This arrangement is shown in Figure 4.

The permanent ventilators installed in the loading hatch above each hold were sealed with laminated paper and masking tape as shown in Figure 5.

The methyl bromide was applied from 50-pound cylinders, and was released through a nozzle that discharged in four directions. The cylinders were placed on the tween deck in three tests and on the weather deck in the fourth, with a length of synthetic tubing leading down through the hatchway to the space just above the grain. This latter procedure allowed the escape hatch to be sealed off and all final preparations to be completed before the gas was re-

TABLE 3

Distribution of methyl bromide in hold #1, ship A, resulting from recirculation for 30 minutes, and disappearance of gas resulting from forced aeration for 5 hours. Dosage 10.6 ounces/1000 cu. ft., temperature 32-44° F.

Sample number	Location	Concentration during fumigation (ounces/1000 cu. ft.)						Concentration during aeration (ounces/1000 cu. ft.)				
		30 min.	1 hour	3 hours	5 hours	7 hours	24 hours	30 min.	2 hours	4 hours	6 hours	24 hours
1	Port, aft, 5′ deep	5	6	4	4	4	2	4	2	0	0	0
2	10′ deep	6	6	4	4	4	2	4	2	0	0	0
3	Port, fore, 5′ deep	6	7	5	4	4	2	4	2	1	0	0
4	10′ deep	8	8	5	4	4	2	3	2	1	0	0
5	Stbd, fore, 5′ deep	6	8	5	4	4	2	3	2	1	0	0
6	10′ deep	18	20	10	8	7	4	4	3	1	1	1
7	Stbd, aft, 5′ deep	6	6	4	4	4	2	3	2	1	0	0
8	10′ deep	6	6	5	4	4	2	3	2	1	0	1
9	Center, 5′ deep	7	7	5	5	4	3	3	2	1	1	0
10	10′ deep	6	6	6	7	8	10	4	2	1	2	1
11	Space above load	8	8	8	8	8	6	3	2	0	0	0

TABLE 4

Distribution of methyl bromide in hold #4, ship A, resulting from recirculation for 60 minutes, and disappearance of gas resulting from forced aeration for 5 hours. Dosage 29.3 ounces/1000 cu. ft., temperature 42-70° F.

Sample number	Location	Concentration during fumigation (ounces/1000 cu. ft.)						Concentration during aeration (ounces/1000 cu. ft.)				
		min. 30	hour 1	hours 2	hours 4	hours 6	hours 24	min. 30	hours 2	hours 5	hours 24	hours 120
1	Port, aft, 5′ deep	84	20	17	13	12	8	13	7	3	4	2
2	10′ deep	8	21	18	15	14	8	10	7	3	4	2
3	15′ deep	0	26	23	18	14	8	9	8	2	5	2
4	20′ deep	2	28	17	11	10	9	8	7	3	5	2
5	Port, fore, 5′ deep	90	27	24	18	16	8	12	7	3	4	2
6	10′ deep	10	47	36	24	13	8	10	8	3	5	3
7	15′ deep	1	6	6	5	7	9	10	8	2	6	2
8	20′ deep	0	0	0	2	6	9	8	8	2	6	2
9	Stbd, fore, 5′ deep	20	20	18	14	12	8	12	7	1	3	2
10	10′ deep	35	20	17	13	11	8	10	7	2	3	1
11	15′ deep	19	20	20	18	18	14	11	5	0	0	0
12	20′ deep	2	24	24	10	10	8	7	7	2	4	2
13	Stbd, aft, 5′ deep	18	18	16	12	10	7	12	6	1	3	2
14	10′ deep	20	17	15	10	8	6	12	7	2	3	2
15	15′ deep	22	18	18	12	12	8	12	8	3	4	2
16	20′ deep	16	15	14	10	9	8	12	7	3	4	2
17	Center, 5′ deep	24	23	22	17	16	12	14	7	3	5	3
18	10′ deep	26	24	24	18	16	12	14	8	3	5	2
19	15′ deep	66	27	31	22	20	14	13	9	4	5	2
20	20′ deep	56	42	34	14	21	14	13	10	5	6	3
21	Top of escape hatch	30	20	15	12	5	14	13	8	4	0	0
22	Center, fore, tween deck hold	18	17	18	16	16	14	10	2	1	0	0
23	Stbd wall, center, 5′ deep	20	17	16	12	10	7	14	8	3	3	0
24	Stbd wall, tween deck hold	18	20	20	16	16	14	11	5	3	0	0

TABLE 5

Distribution of methyl bromide in hold #5, ship A, resulting from recirculation for 30 minutes, and disappearance of gas resulting from forced aeration for 3 hours. Dosage 9.6 ounces/1000 cu. ft., temperature 38-48° F.

Sample number	Location	Concentration during fumigation (ounces/1000 cu. ft.)						Concentration during aeration (ounces/1000 cu. ft.)				
		30 min.	1 hour	2 hours	3 hours	5 hours	24 hours	30 min.	1 hour	3 hours	5 hours	24 hours
1	Stbd, fore, 5′ deep	4	6	5	4	5	3	1	1	0	0	0
2	10′ deep	4	6	5	4	5	2	0	0	0	0	0
3	15′ deep	4	6	5	4	5	2	2	1	0	0	0
4	20′ deep	4	6	5	4	4	3	1	1	0	0	0
5	Stbd, aft, 5′ deep	6	7	6	3	3	3	2	1	0	0	0
6	10′ deep	0	5	4	3	3	2	1	1	0	0	0
7	15′ deep	0	4	2	0	0	1	1	1	0	0	0
8	20′ deep	0	4	2	0	0	1	1	0	0	0	0
9	Port, aft, 5′ deep	5	7	5	4	4	3	1	1	0	0	0
10	10′ deep	8	7	5	5	2	2	2	0	0	0	0

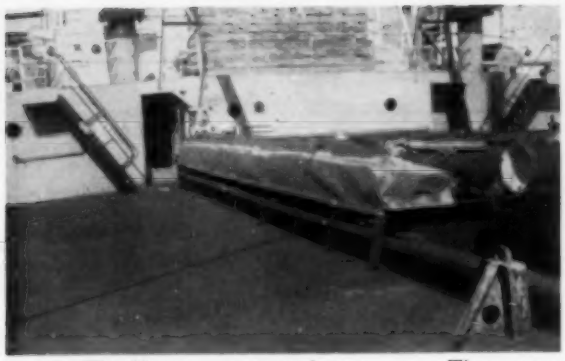

Figure 5. — Seal over ventilators installed in the loading hatch cover. These are kept in place during fumigation but removed during aeration.

leased. The blower was started just before the release of the gas was made.

In holds #1 and #5, ship A, one 50-pound cylinder was released, but in holds #4, ship A, and #5, ship B, three cylinders of methyl bromide were used. The rate of application for each hold is shown in table 1.

Where the smaller dosage rate was used, the air-gas mixture was recirculated for 30 minutes at the beginning of the fumigation, and where the large rate was used, a 60-minute recirculation was employed. In each instance it was determined that maximum distribution had been accomplished before the blower was shut off, by readings on the gas analyzer. The air flow rates are shown in Table 2.

Gas samples were taken from all locations at the expiration of 30 minutes after application of the gas, then hourly for the remainder of the work day, and at 24 hours. Aeration was begun after the 24-hour reading by removing the seal over the escape hatch, and from the ventilators in the loading hatch, and reverting the recirculation system back to an aeration system. The grain was aerated until the end of the work day in the March tests, but for only two hours in the June tests lest the grain temperature be raised by excessive introduction of warm outside air. After the aeration was completed the probes and sampling tubes were removed.

Results

The data on distribution of methyl bromide in the grain, and the concentrations remaining after various periods of aeration are given in tables 3 to 6.

These tests demonstrate that the mechanical aeration systems as installed on the Reserve Fleet ships can be converted to provide recirculation, and that the air flow rates used for grain aeration are adequate to produce good distribution of methyl bromide through the grain mass. There are a few areas where the gas concentrations are high or low, such as location 6 in hold #1, ship A; locations 7 and 8 in holds #4 and #5, ship A; and #5, ship B. In general, however, the distribution is fairly uniform at the end of the first hour. It is probable that the inequalities found are due to imbalance in the air flow through the grain, which are to be expected. In fact, it is indicated that studies of gas distribution such as these would be helpful in evaluating the pattern of air flow in the aeration system.

The removal of the methyl bromide by converting back to the aeration system at the end of the fumigation was also satisfactory. In the tests where the lower dosage rates were used, it was demonstrated that practically all gas can be removed from the grain mass in a reasonable length of time. Conditions existant at these fleets made it impractical to complete the aeration of the tests where the larger dosage rates were used, but there is no doubt that complete removal of the gas could have been accomplished with a longer aeration period.

The natural infestation in one hold of those used in these tests was

FRY BAG CLOSING MACHINE

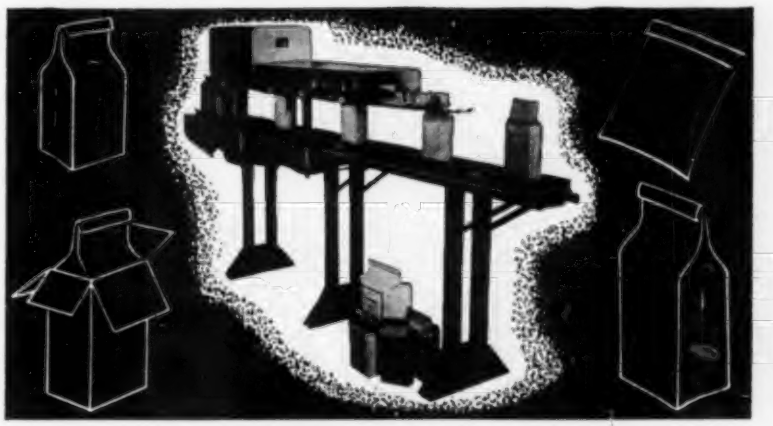

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TABLE 5 (Cont.)

		min. 30	hour 1	hours 2	hours 3	hours 5	hours 24	min. 30	hours 1	hours 3	hours 5	hours 24
11	15′ deep	6	7	6	6	4	1	1	1	0	0	0
12	20′ deep	6	6	4	4	2	2	2	1	0	1	0
13	Port, fore, 5′ deep	6	6	4	4	4	2	1	1	0	0	0
14	10′ deep	5	5	5	4	4	2	2	1	0	0	0
15	15′ deep	5	4	5	4	4	3	1	1	0	0	0
16	20′ deep	5	4	5	4	3	3	2	1	0	1	0
17	Center 5′ deep	7	6	6	6	4	4	1	1	0	1	0
18	10′ deep	6	7	6	6	5	4	2	1	0	1	0
19	15′ deep	6	7	6	6	5	4	2	1	0	2	0
20	20′ deep	6	6	6	5	4	3	1	0	0	1	0
21	Space above load	7	8	8	7	5	2	1	1	0	0	0
22	Port, side wall, 5′ deep	5	6	5	5	4	2	1	1	0	1	0
23	Stbd wall, aft, tween deck hold	6	7	6	6	4	2	1	0	0	0	0
24	Port wall, fore, tween deck hold	5	6	6	6	4	1	0	0	0	0	0

TABLE 6

Distribution of methyl bromide in hold #5, ship B, resulting from recirculation for 60 minutes, and disappearance of gas resulting from forced aeration for 2 hours. Dosage 29.1 ounces/1000 cu. ft., temperature.

Sample number	Location	Concentration during fumigation (ounces/1000 cu. ft.)							Concentration during aeration (ounces/1000 cu. ft.)			
		min. 30	hour 1	hours 2	hours 3	hours 4	hours 6	hours 24	min. 30	hour 1	hours 2	hours 24
1	Stbd, fore, 5′ deep	68	24	18	16	16	14	14	16	8	4	4
2	10′ deep	70	23	18	18	13	15	12	15	8	4	5
3	15′ deep	20	22	16	17	13	14	12	12	10	5	5
4	20′ deep	2	26	19	20	15	15	11	11	12	6	4
5	Stbd, aft, 5′ deep	14	23	18	22	20	22	16	8	5	2	0
6	10′ deep	1	12	10	6	7	7	9	7	5	5	5
7	15′ deep	2	2	1	7	2	3	7	6	4	3	4
8	20′ deep	1	4	2	5	1	2	6	7	4	2	4
9	Port, aft, 5′ deep	60	26	15	17	10	12	13	14	12	8	6
10	10′ deep	4	26	20	14	12	14	14	12	11	8	7
11	15′ deep	2	T	2	5	3	6	11	13	10	7	7
12	20′ deep	10	14	11	10	11	14	14	14	7	6	7
13	Port, fore, 5′ deep	22	21	20	20	18	16	9	11	7	4	4
14	10′ deep	26	22	22	21	20	14	9	14	7	4	4
15	15′ deep	30	22	24	22	20	15	8	15	7	5	5
16	20′ deep	46	24	25	21	16	13	7	11	9	4	5
17	Center, 5′ deep	21	24	18	20	18	18	15	11	8	6	6
18	10′ deep	28	18	17	15	15	16	11	14	8	5	7
19	15′ deep	54	24	18	20	18	22	15	14	7	5	6
20	20′ deep	10	18	16	14	13	12	8	11	10	6	6
21	Space above load	25	24	21	20	20	20	16	6	6	4	0
22	Port wall center, tween deck hold	22	24	21	20	20	20	16	4	4	2	0
23	Port wall, 5′ deep	24	21	22	21	20	20	15	7	7	2	8
24	Escape hatch	26	23	20	21	21	20	15	10	8	4	0

completely wiped out. Samples held for over 30 days had no emergence from egg or larval stages present at the time of fumigation. The dosage rate in this instance was 1.82 lbs./1000 cu. ft.

(*Part 2 Next Month*)

AMMONIA CONFERENCE

(*Continued from Page 50*)

C. W. Bourg, PV-82, Lincoln, Neb. C. Woods, Olin-Mathieson Co., Baltimore, reviewed mobile storage specifications, while the "art" of ammonia metering was reported by J. R. Turner, Shell Chemical Co., San Francisco. In outlining the factors affecting the rate of transfer of ammonia from bulk plant to field tanks, N. LeBlanc, Henry Valve Co., Chicago, reported that only the capacity of the compressor or liquid pump, and the size and efficiency of the transfer system directly affect the rate of transfer. However, he said, the following are factors critical in determining the efficiency of a piping system: size and length of pipe, amount of valves, size of hoses, kind of hose couplings, size and capacity of the filler valves, density of the liquid and viscosity.

In the same panel, O. Clark, Clark Manufacturing Co., Atherton, Mo., reported on simplified applicator and tank design.

During the business sessions of the conference, eight members were elected to 3-year terms as members of the board of directors and one man, J. W. Dugan, Plantations Fertilizers Corp., Houma, La., was elected to a 2-year term to fill a vacancy on the board. Those elected to full terms were: C. J. Buyer, Mid-West Fertilizer Co., Vincennes, Ind.; M. H. Carter, Farmers Supply Coop, Greenwood, Miss.; C. Corken, Corken's Inc., Oklahoma City, Okla.; O. L. Garretson, United Farm Chemical Co., Roswell, N.M.; Norman LeBlanc, Henry Valve Co., Melrose Park, Ill.; M. O. Rasberry, Delta Liquid Fertilizer Co., Helena, Ark.; T. W. Talbot, Audubon, Ia.; and L. H. Wright, Phillips Petroleum Co., Bartlesville, Okla.

Trade Show Attracts Interest

MORE than 30 exhibitors participated in the trade show held during the 3-day meeting, featuring application equipment, storage units, valves, nozzles, tubing, service, safety appliances, etc. Besides its display of anhydrous ammonia, the Mathieson Chemical Corp. booth featured a display of portable irrigation systems, its line of pelletized high analysis fertilizer "Ammo-Phos," cotton dusts, and Mathieson cotton insecticides. Edward S. Nelson, Ltd., described its ammonia storage system, and displayed its ammonia supplies, including an ammonia first aid kit, complete with safety chart and first aid instructions. The Flint Steel Corp. exhibit featured the Flint application, storage and farm service tanks; while a display by Mine Safety Appliances showed a complete service for safety in handling anhydrous ammonia, first aid kit, masks, etc.

Other exhibitors included the K.B.H. Corp., J. B. Beaird Co., Henry Valve Co., Delta Tank Co., Agriform Co., etc.★★

POTATO SCAB CONTROL

(*Continued from Page 61*)

plot. The 200-pound rate also caused a very pronounced depression in early vine growth. The reduction in yield and depression in vine growth are significant in view of the fact that other workers have reported that the phytotoxic level was low and the yields on muck soil were not impaired by furrow applications of 2,000 pounds per acre of active ingredient, which if a 20% material was used would amount to 10,000 pounds of PCNB per acre in the row. In the present tests, 267 pounds of 75% material applied in the row was toxic. Apparently the phytotoxicity of PCNB was very much greater under the Beltsville conditions than it was when used on muck. However, there was no evidence of phytotoxicity at the 150-pound rate.

Although the increase in marketable potatoes, compared with no treatment, was highly significant for the 200-pound rate, the significant de-

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crease in total yield and the depression in vine growth clearly indicate that the limits of safe application had been exceeded. Significant reductions in scab without appreciable effects on yield were obtained with the 100- and 150-pound rates. Further work needs to be done on the cumulative effects of these treatments on the same land over a period of years.

The OPP sprays had no effect on total yield, and although there was some indication that they reduced scab compared with no treatment, the percentages of scabby potatoes obtained (55 to 66 per cent) were too high for this material to be considered effective as used.

Conclusions

Pentachloronitrobenzene showed considerable promise as an effective soil fungicide for the control of potato scab on upland soil. However, applications in the row above 150 pounds active ingredient per acre apparently were phytotoxic to potatoes and therefore more work should be done on preplanting applications at these rates. Information is also needed on the cumulative effects of successive applications of this material.

Sodium orthophenylphenate solutions sprayed on the soil ahead of the planter had no effect on potato yields, but the material as used was not effective in control of potato scab.

Paraformaldehyde was not effective as a soil fumigant for controlling potato scab, and the test with hexachlorocyclopentadiene was inconclusive because much of the vapor was lost from the soil directly after application. Sulfur reduced the percentage of scabby potatoes, 400 pounds per acre being almost as effective as 800 pounds, but it was not so effective as pentachloronitrobenzene in reducing the percentage of scab.★★

SYSTOX - DEMETON

(*Continued from Page 48*)

that this material possesses systemic insecticidal and acaricidal properties which, in such combination, are as yet unexcelled. However, its toxicity to mammals makes certain precautionary measures imperative (21). Therefore, Farbenfabriken Bayer have concentrated their efforts on the development of less toxic organic phosphate insecticides. In the systemic field, a first result of this line of research, namely Meta-Systox, has recently been released for large-scale experimentation and preliminary sales. Meta-Systox is the dimethoxy-homolog of Systox. The active ingredient in commercial Meta-Systox has an oral acute lethal dose to rats of approximately 80-100 mg/kg, as opposed to 12-20 mg/kg for Systox. However, it requires roughly twice as much Meta-Systox active ingredient per acre or per hundred gallons of water to achieve the same degree of control of aphids and mites (20). Table 2 (on page 48) gives physical and pharmacological information on Meta-Systox.

A development very similar to that in the systemic field has taken place in the field of non-systemic organic phosphate insecticides. Here, parathion, or E-605, as it is being called in Europe and a number of other countries where Schrader's laboratory number for the compound has been put under trademark protection, represents a climax in insecticidal effectiveness comparable to Systox. It is gratifying to note that in the field of non-systemic organic phosphates also, the trend is clearly toward less toxic compounds, as exemplified by the recent release of Bayer's chlorthion (1, 13) and dipterex (2), as well as certain materials developed by American Cyanamid Co., New York and the Geigy Co., of Basle, Switzerland.

Looking back as well as toward the future, it appears that the organic phosphate insecticide field which was opened up by Farbenfabriken Bayer's pioneer work is by no means fully explored and exploited yet. It does not appear unconservative to anticipate further interesting developments in this field, in the way of discovery of new compounds as well as in evolving

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a better understanding of the factors determining the efficacy of existing materials, as well as in the development of formulations and methods of application increasing the effectiveness of products which are currently on the market.★★

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SYSTEMIC INSECTICIDES

(*Continued from Page 36*)

Summary

OF 12 chlorinated hydrocarbon insecticides tested for systemic activity by subcutaneous administration to guinea pigs infested with screw-worms, *Callitroga hominivorax* (Cqrl.), five were found effective and lindane, dieldrin, and aldrin were selected for further study. Infested cattle were treated subcutaneously with five-per cent solutions of these materials in peanut oil. Dieldrin at 25 mg./kg. and aldrin and lindane at 50 mg./kg. killed screw-worms infesting the host at time of treatment and those introduced into wounds made up to a month after treatment.

The same treatments given at 28-day intervals to cattle naturally infested with *Hypoderma lineatum* (De Vill.) had no effect on first-instar larvae but killed second-or third-instar larvae in the cysts. When similar treatments were given to cattle naturally infested with second-and third-instar *H. bovis* (Deg.) most of the insects were killed, but a few survived to produce apparently normal flies.

Since all three insecticides were lethal to cattle when given orally at 25 mg./kg., subcutaneous injections are required for safe treatment of a cow with a quantity large enough for the desired systemic effect.

Subcutaneous injections of peanut oil solutions of the insecticides caused the chemicals to be deposited in the fat of the cattle. Four months after treatment with aldrin and dieldrin large residues still remained, but lindane had almost disappeared from the fat.★★

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NORTH CAROLINA STA.

(*Continued from Page 53*)

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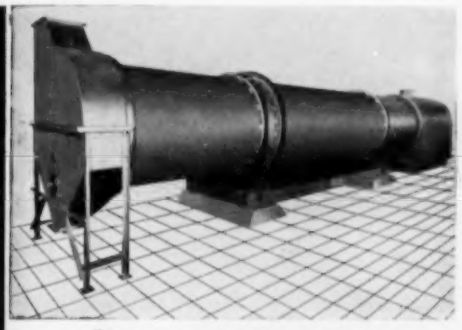

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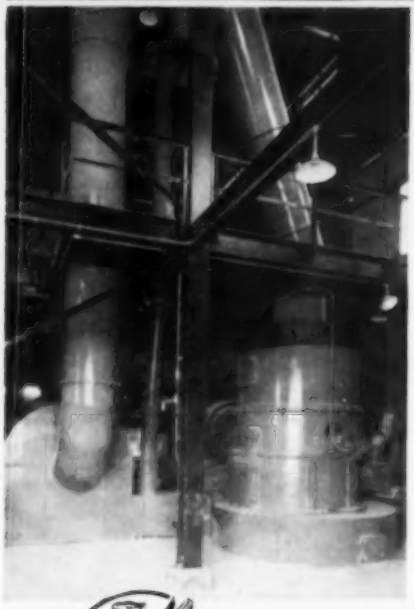

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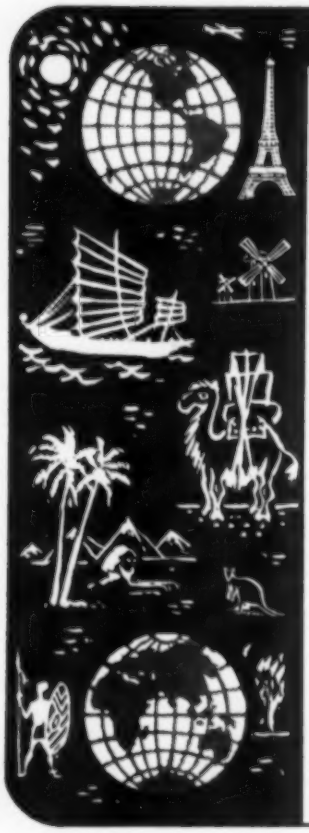

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Recently, Dr. C. H. Brett has noted that cabbage worms seem to be developing a resistance to DDT in North Carolina; this is thought to be the first time this has been observed in the South. Dr. Brett is conducting promising investigations into the control of Mexican bean beetles, sweet corn insects and corn ear worms. Dr. R. T. Gast is studying the use of systemic insecticides on cotton insects; Dr. F. E. Guthrie is conducting tobacco insect research, primarily on emulsifiers in formulations used in transplanting solutions; Dr. W. M. Kulash conducts a project in stored grain pests; and Dr. R. L. Rabb is investigating the biology of tobacco insects.

As old problems are conquered, new ones appear and lesser ones gain in importance. A newly-appreciated problem which has always been with us is supplied by nematodes. For every North Carolina crop, there is probably at least one parasitic species of nematode to attack it; in tobacco alone, the pests cause a $30 million annual loss. It is generally considered the most pressing problem facing the state's farmers.

The North Carolina Experiment Station is spearheading a regional nematode research project. Its work was launched by "Nickels for Know-How" funds and is directed by Dr. J. N. Sasser, who, working with Dr. Nusbaum and other plant pathologists, has found that nematodes in tobacco cause an indirect as well as direct loss. They weaken resistant varieties, leaving them open to attack by black shank and wilt.

In North Carolina home gardens, nematodes account for a $2½ million loss a year. They do untold damage to forage and nursery crops, cotton, peanuts, and other crops previously thought to be safe from nematode attack.

Dr. Sasser has discovered that not all species of nematodes react equally to soil fumigation. Until recently, plant pathologists assumed that fumigants would kill all parasitic species. The Experiment Station, working with the U. S. D. A., has contributed a great deal to nematode control, largely through rotation programs and research on soil fumigation. Dr. Sasser has catalogued more than 16 different species, matching them with the plants on which they feed. Some progress has been made by agronomists in breeding resistant varieties, such as Rowan lespedeza.

These are but a few of the research projects most closely related to the field of agricultural chemicals. Success in any one of the projects would be valued in millions of dollars. As Dr. R. P. Upchurch puts it, "We know the answers are there; it will just take time to find them."★★

COTTON INSECT CONFERENCE

(*Continued from Page 40*)

Compound 3911* (0-0-diethyl-S-ethyl mercaptomethyl dithiophosphate) was tested at College Station. When mixed with activated carbon and applied to cotton at seed planting time at the rate of 4 pounds per 100 pounds of seed, the compound killed thrips, spider mites, cotton aphids, boll weevils and cotton leaf perforators for a period of from 4 to 9 weeks following emergence of the seedling plants. The compound is reported to have a rather high mammalian toxicity.

Tests on another interesting compound 17147** (the chemistry has not been released) have shown that the compound will control boll weevils, cotton aphids and spider mites when applied at one-quarter pound per acre. Cotton bollworms were controlled with one-half pound per acre and pink bollworms were controlled with from one-half to three-quarters pound per acre. This is the first phosphorus compound tested to even show promise in the control of bollworms.

The Texas Agricultural Experiment Station engineers in cooperation with the entomologists at College Station have developed an experimental stalk cutter-shredder which promises to destroy all the pink bollworms during the shredding operation.

How the U. S. Weather Bureau can give the cotton farmer more help with his insect problem was considered in a report by James M. Beall, who told the cotton leaders that there

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is an increasing need for basic and applied weather research to help the American farmer. There is a need, he said, to localize forecasts and make them apply to the farmer's specific location and crops. The Bureau, he reported, plans to establish about 50 farm service offices over the country to issue such routine day-to-day bulletins.

A meeting of cotton state entomologists was held prior to the cotton conference, at which time the 1955 recommendations were discussed. C. F. Rainwater acted as secreary at this session, which submitted the state recommendations to the conference.★★

SURPLUS PROBLEM

(*From Page 46*)

tainly, even a significant advance in the application by farmers of improved farming methods based on proved research results could be the real key to the solution of the current farm surplus problem.

Now, turning briefly to the longer-term problem of feeding our rapidly increasing population, I think that perhaps the most significant results from the above proposal would be the long-term benefits. In effect, the experiment stations are saying, "Let us produce maximum yields at minimum costs on as few acres as possible." If this advice were followed, American farmers would remove from cultivation millions of acres of land presently in need of rebuilding, but which undoubtedly will be needed to feed and clothe our future generations. For the future, this may prove to be a greater benefit than the short-term results.

For you who are primarily interested in anhydrous ammonia, I would like to emphasize that progress along the lines I am suggesting can be accomplished only if farmers use the kinds and amounts of plant foods needed to produce optimum results in terms of yields and profits for their particular crops and soil conditions. Proper balance in the application of plant foods is just as important—if not more so—than the amount which is applied.

This is vividly illustrated by recent results of research conducted by the Virginia Agricultural Experiment Station. Nitrogen used alone increased yields of orchard grass seed by 135 per cent. But when the same amount of nitrogen was used in combination with balanced quantities of phosphate and potash, the yield was increased by more than 300 per cent.

A further study of these data shows that phospate and potash not only complemented the nitrogen, but that the nitrogen also complemented the phosphate and potash. Similar results were obtained on hay.

There are numerous data to bear out the fact that maximum results and in most cases optimum results from an economic point of view, can be obtained only by using a balanced combination of the various plant food elements. The ideal combination naturally will vary from area to area and crop to crop.

Many of you already undoubtedly have had experiences showing that anhydrous ammonia alone does not produce maximum results unless the other plant food elements are present in the proper proportions. Nitrogen generally is recognized as the yield regulator among the plant elements, and if applied only in moderate quantities frequently will produce spectacular results if there is no shortage of the other elements. But it should be recognized that the portion of every crop which is harvested and removed from the land takes with it large quantities of all the plant foods. These must be replaced if the land is to continue to be fertile.

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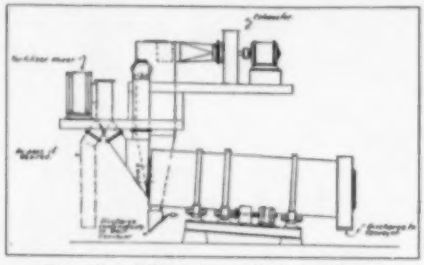

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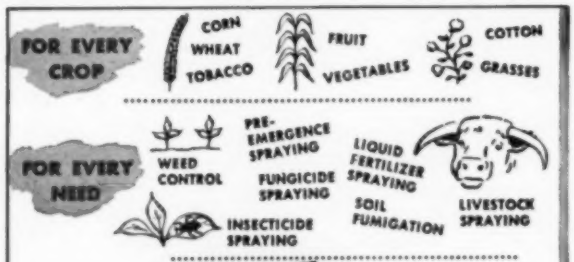

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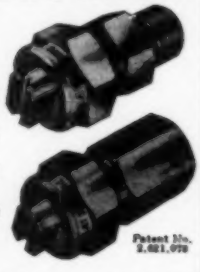

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EDITORIAL

(*Continued from Page 33*)

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Tale Ends

DR. Rosmarie von Rumker, research director for Chemagro Corp., New York, was the subject of an article in the *Houston Chronicle* following her invitational paper at the recent ESA meeting in Houston. She has been associated with the field of entomology since childhood, for on her family's farm in Bavaria they were engaged in breeding seed stocks. When the Russians overran Bavaria, survivors of the family escaped with 300 lbs. of seed stocks with which they finally succeeded in reaching Germany. Thus development of these special miniature grain varieties could be continued.

Dr. von Rumker subsequently received her Ph.D. from the University of Bonn at the age of 23, and then began her career with Farbenfabriken Bayer. She made her first trip to the United States two years ago. She comments on the differences in educational preparation in United States and in Europe. Whereas in the U.S. we tend to specialize, in Europe workers in this field will have double majors,—both entomology and plant pathology,—and perhaps a substantial amount of chemistry and other subjects as well.

Dr. von Rumker is the author of an article in this issue of Ag Chem (Pg. 47) delivered at the recent meeting of the Canadian Entomological Association. Her paper, "Developments in Phosphate Insecticide Research," given at Houston, which incidentally many listeners indicated is one of the few on the subject which is readily understandable by the average non-technically trained reader, will appear in an early issue.

AC

Dr. E. N. Cory, perennial secretary of ESA, missed one of his few national meetings when he was unable to attend the Houston convention. He was recently elected an honorary member of ESA, one of the few members of the society ever to be so honored.

AC

An excellent moving picture on "General Entomology" was one of the highlights of the meeting. It was shown by Dr. Charles Palm of Cornell University, past president of ESA. Prints of the film are available from Encyclopoedia Brittanica Films, Inc., Wilmette, Ill. Also high on the photographic list were some excellent color pictures of rose growing which accompanied the paper by Smith, Taylor and McClellan dealing with combination dusts for pests and diseases of outdoor roses.

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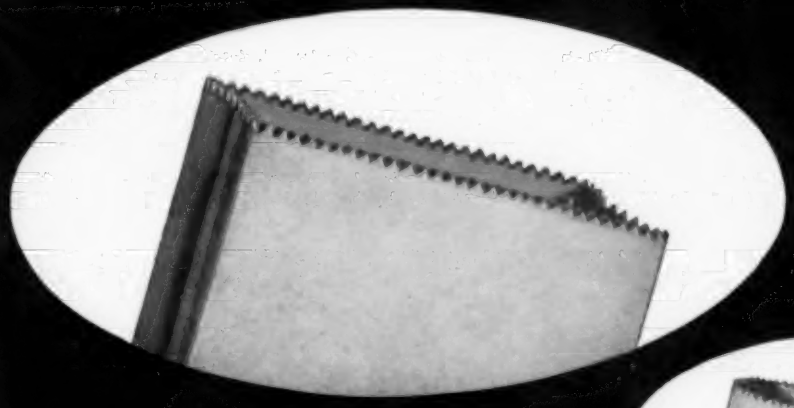

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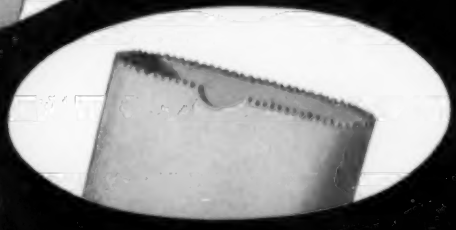

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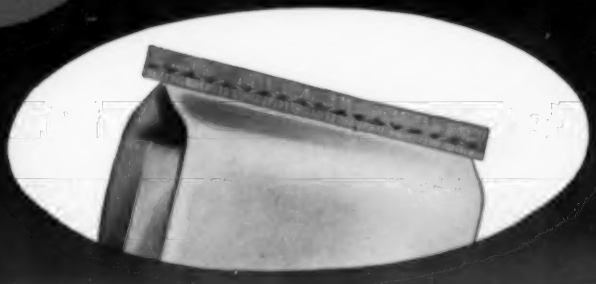

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• Lower packaging costs • Reduced freight costs • Better stacking of filled bags • Both filled and empty bags require less storage space • Shipping and storage on Bagpak Disposable Pallets cut unloading costs • Maximum protection against sifting, contamination, infestation, dampness • Full measure always emptied • Minimum dust hazard • Advertising message can be printed on face of bags

Bagpak production and quality are backed by the tremendous countrywide facilities and resources of the International Paper Company. For complete information and suggestions as to how you can package and ship your product more profitably, write: D-39

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Pyrenone combines two remarkable and effective insecticidal materials in varying ratios—*piperonyl butoxide* and *pyrethrins*. Together they produce an effectiveness and versatility that assure positive control of a wide range of insects.

High rate of knockdown, low concentrations required for final kill or long-lasting protection with one application—all these are "reasons why" Pyrenone is so economical to use. For full details—and specifications to meet your needs—contact your nearest Fairfield office or write to the address below.

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